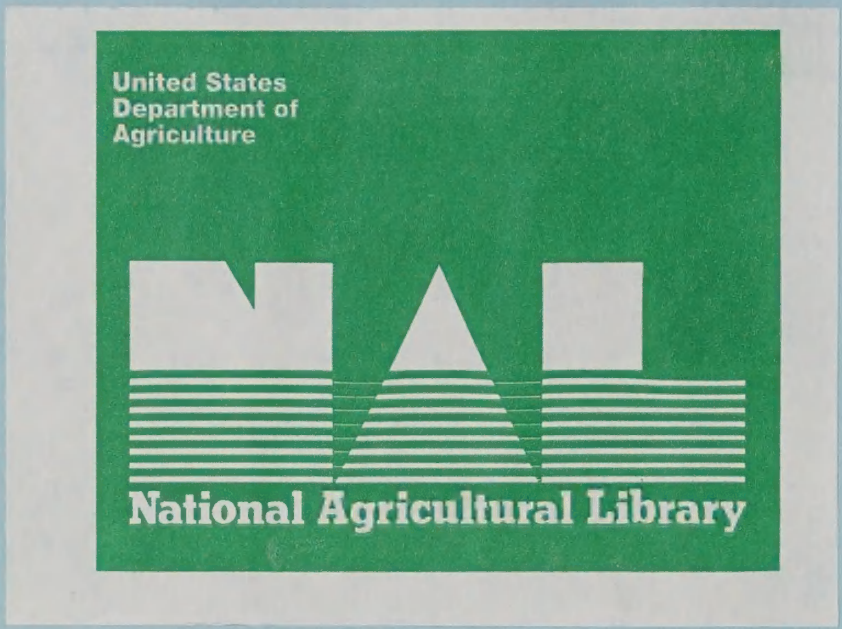
Sugar Beet Crop Germplasm Committee Meeting Minutes

February 10th, 1999

(in conjunction with the ASSBT Meeting)

Orlando, FL.



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Minutes of the Sugar Beet CGC Meeting held Wednesday, February 10th, 1999 in conjunction with the ASSBT Meeting in Orlando, FL.

Attending: Alan Stoner (USDA/ARS), JR Stander (Betaseed, Inc.), Charlie Rush (Texas A&M University), Lee Tungland (Novartis, Seeds), Joe Saunders (USDA/ARS), John Kern (American Crystal Sugar, Co.), Alan Hodgdon (USDA/ARS), Lee Panella (USDA/ARS), Bob Lewellen (USDA/ARS)

Excused: Irwin Goldman (University of Wisconsin), Larry Campbell (USDA/ARS), Shaoke Wang (Seedex, Inc.)

Guests: Roy Martens (Novartis, Seeds), Gerhard Steinrücken (Novartis, Seeds), J. Mitchell McGrath (USDA/ARS)

1. **Membership Elections**
Re-elected were Lee Panella & Larry Campbell. Charlie Rush stepped down and will be replaced by Dr. Carol Windels of the University of Minnesota Experiment Station in Crookston. John Kern was replaced Bill Doley who left American Crystal Sugar Co. and Shoake Wang has stepped in for Akio Suzuki from Seedex. Mitch McGrath from USDA/ARS in East Lansing, MI was elected to the Committee.

Note: Since this meeting, Dr. John Kern of American Crystal Sugar Co. has decided to resign from the Sugar Beet CGC and his seat will be filled by Mark Law of Holly Hybrids.

2. **Sugar Beet CGC Coordinated Evaluation Results** - See Appendix 1
The Sugar Beet CGC will submit a proposal to evaluate 30 PI accessions from the National Plant Germplasm System's *Beta* collection for the same descriptor's that were evaluated this past year.

3.

Status Report on the *Beta* Collection at the USDA, ARS, Western Regional Plant Introduction Station to the Sugar Beet Crop Germplasm Committee Curator: Dr. Alan Hodgdon, 1998

INCREASE ACTIVITY

Eighty-one accessions harvested in 1998 at W-6 have been cleaned and weighed. Thirty-seven were increased in the greenhouses. These rated 17 good,16 fair and 4 poor. forty-four accessions were increased in the field isolated in tents. These rated 8 good, 27 fair and 9 poor. W-6 has established

an excellent working relationship with the IDBB [Europe] for exchanging and increasing *Beta* germplasm. Approximately 200 PI accessions are being included in the IDBB *Beta* synthetic core collection. A number of PI's have been increased in Europe as a part of the EU sponsored GENRES CT95 42 Program. We have received 16 of these that were on our increase priority list. We also received 47 wild beet accessions from Europe which have been given PI numbers. In the 1998 crop year, 80 PI's will be increased in Europe; thirteen of these are on our increase priority list. We have also had great support from sugar beet industry companies in the United States through the BSDF. In 1998 16 beet accessions will be increased by U.S. companies. This help is greatly appreciated.

The following table shows the *Beta* increase activity at W-6 in the years 1995- 1998.

Location	Year	Started	Germinated	Harvested	Carried Over
W-6	1995	94	9	27	
W-6	1996	62	5	66	
W-6	1997	92	5	59	
Novartis	1997	16		16	
W-6	1998	83	7	85	74
Europe	1998	80			80
U.S.	1998	16			16
Totals		443	26	253	170

There are now 469 *Beta* accessions on the increase priority list. This is down from 537 in 1997. There are 20 accessions in our inventory that we have not been able to germinate. Sixteen of these are probably lost from the collection.

A new growth chamber for vernalizing sugar beet has been purchased by the station. It is now in use and has improved our facilities greatly. We also have an excellent new seed thrasher mainly for the *Beta* program. The principle problems with our increase program are lack of greenhouse space and poor overwintering of the field plots. We may have to increase all biennial *Beta* in the greenhouses. We are trying to get more greenhouse space.

GERMINATION TESTS

In 1998 we tested 54 samples from the W-6 1996 harvest. Of these seed, two were less than 50% viable. Nineteen of these accessions were more than 40% dormant. Samples from 45 accessions from the 1997 harvest are now being tested. Also, at NSSL, 19 accession of W-6 increases from 1993, 1994, and 1995 were tested. One of these samples had 30% viability and the remaining were in the 80-90% range.

SEED BACKUP

We continue to backup seed at NSSL. At W-6, we have a new -20°C freezer for storing seed. We have frozen 1130 original *Beta* seed samples, most of which contain 200 seed. Additionally, we have frozen 706 PI regeneration samples of 400 seed from each accession. These sample were carefully chosen for viability and to represent the original seed source. 400 should be sufficient for two regeneration cycles.

4. Report of the National Germplasm Resources Laboratory - See Appendix 2

5. Status of the NPGS Core Subsets (Plant Germplasm Operations Sub Committee) - See Appendix 3

6. Revamping of the GRIN Codes

The increased capacity of the GRIN database allows the user to put in letter codes for the different descriptor ratings. A committee composed of Lee Panella and Lee Tungland presented the changes in the codes for descriptors. These were discussed and those descriptors listed below will have the codes changed as shown.

Descriptor	Letter Code	Number Code
Growth Habit	New Code	Old Code
Erect	ER	1
(Procumbent) Semi Erect	SE	3
Prostrate	PR	5
Compatibility (New Descriptor)	New Code	Old Code
Self Fertile	SF	
Self Sterile	SS	
Pollen Sterile	PS	
Mixed	MX	
Uniformity	New Code	Old Code
Uniform single type	UN	1
Variable type	VA	2
Mixed type	MX	3
Cluster Fasciation	New Code	Old Code
Absent	AB	0
Present	PR	9
Flesh Color	New Code	Old Code
White	WH	1
Yellow	YE	2
Orange	OR	3
Red	RE	4
Purple	PU	5
Mixed	MX	
Flowering Pattern (between Plants)	New Code	Old Code

Descriptor	Letter Code	Number Code
Synchronous	SYN	1
Asynchronous	ASY	2
Flowering Pattern (within Plants)	New Code	Old Code
Determinate	DE	1
Indeterminate	IN	2
Hypocotyl Color	New Code	Old Code
Green	GG	
<50%Green	PG	
<50% Red	GR	
Red	RR	
Leaf Hairiness	New Code	Old Code
Absent	AB	
Sparse	SP	
Hairy	HA	
Leaf Pigmentation	New Code	Old Code
Light Green	LG	1
Green	GR	2
Green-red mixture	MX	3
Red	RE	4
Chlorophyll mutant	CM	5
Male Sterility	New Code	Old Code
Fertile	FE	1
Semi-Sterile	SS	2
Sterile	ST	3
Petiole Color	New Code	Old Code
Green	GR	1
Pink	PP	2
Red	RE	3
Mixed	MX	4
Yellow	YE	5
Ring Color	New Code	Old Code
White	WH	1
Yellow	YE	2
Orange	OR	3
Red	RE	4
Purple	PU	5
Mixed	MX	

Descriptor	Letter Code	Number Code
Root Color	New Code	Old Code
White	WH	1
Yellow	YE	2
Orange	OR	3
Red	RE	4
Dark Red	DR	5
Brown	BR	6
Black	BL	7
Mixed	MX	
Root Type	New Code	Old Code
Single	SI	1
Fanged	FA	2
Very Fanged	VF	3
Fibrous	FI	
Crown Height	New Code	Old Code
Very Low	VL	1
Low	Low	3
Medium	ME	5
High	High	7
Very High	VH	9
Root Shape	New Code	Old Code
Narrow elliptic	NE	1
Elliptic	EL	2
Circular	CI	3
Broad elliptic	BE	4
Narrow oblong	NO	5
Narrow triangular	NT	6
Non-swollen	NS	7
Rosette	New Code	Old Code
Completely Absent	AB	0
Prostrate	PR	1
Semi-Erect	SE	-6
Erect	ER	9
Stem Pigmentation	New Code	Old Code
Green	GR	0
Striped	ST	1
Red	RE	2
Candy striped	CS	
Sterility Type	New Code	Old Code
Genetic male sterile	GMS	1
Cytoplasmic male sterile	CMS	9

Descriptor	Letter Code	Number Code
Sutures	New Code	Old Code
No Sutures	NS	0
One Suture	1S	1-8
Many Sutures	MS	9
End Use	New Code	Old Code
Leaf Vegetable	LV	1
Root Vegetable	RV	2
Leaf and Root Vegetable	LR	3
Fodder	FO	4
Sugar Extraction	SB	5
Biomass	BI	6
Use Unknown	**Drop Code**	**7**
Other (specifiy)	**Drop Code**	**8**
Isolation	New Code	Old Code
Near Cultivated Populations	NC	1
Near Wild Populations	NW	2
Near to both wild and cultivated populations	NB	4
Isolated from both wild and cultivated populations	IS	3
Germity	New Code	Old Code
Monogerm	Mo	1
Monogerm and multigerm mixed	Mx	2
Multigerm (2-4)	MM	4
Highly multigerm (>5)	HM	5

7. Reminder to sugar beet breeders to send seed from new releases to USDA, ARS, Western Regional Plant Introduction Station.

When a germplasm is released by ARS, it is required to deposit a small sample at the NSSL to receive a PI number. Whenever possible, breeders who are releasing germplasm should also send a sample to the working collection at Pullman. This saves the cost and effort of regenerating the samples from the NSSL. As large a sample as possible should be sent. If the breeder can send 100 - 500 grams (not always possible, but often it is), the seed can be put into storage and won't require regeneration. This frees up resources and our curator to concentrate his effort on the hard-to-increase accessions.

8. Revision of the 'Status of Beta Germplasm in the U.S.' Report

In preparation for a revision of the 'Status of Beta Germplasm in the U.S.' report to the National Plant Germplasm System, members were asked to review chapter 2 entitled "Status of Sugar Beet Crop Vulnerability" (pp. 5-7) and the needs statements in Chapter 4

section D entitled "Enhancement" (pp. 27-33). Those should be returned to the Chairperson by January 1st, 2000.

9. **Collection Trips**
Future collection trips were discussed. However many of the areas that would be most desirable to collect in are inaccessible for political reasons. No new collection trips were proposed.

10. **Upcoming WBN Meeting - 3rd and final call for presentations** - See appendix 4

11. **Minutes of the 3rd GENRES CT95 42 Meeting.** - See appendix 5

12. **New Business**

Announcing the 3rd Sugarbeet Workshop
Sunday, January 9, 2000, 8:00 to 10:30 PM
in conjunction with the
Plant and Animal Genome VIII
January 9 - 12, 2000
Town & Country Hotel, San Diego, CA USA

The Sugarbeet Workshop has been an opportunity for sugarbeet biotechnology researchers to present and exchange work and ideas regarding present and future directions of sugarbeet genomics research. A larger context is provided through interaction with the genomics community using a variety of agricultural models outside the Sugarbeet Workshop under the umbrella of the Plant and Animal Genome meetings. Attendance at these meetings has been more than 1000 people and growing.

The Sugarbeet Workshop will be in its third year. To continue the success of the past two years, we will need volunteers willing to present a synopsis of their research. We anticipate the Sugarbeet Workshop program will follow a similar format as in past years, providing adequate interest is arranged. Suggestions for improving the workshop are always appreciated.

In this vein, you are invited to submit an abstract for the Sugarbeet Workshop to be held during the Plant and Animal Genome VIII meetings in January 2000. Our focus will be on genomics of sugarbeet, related species, and their various pathogens including (but not necessarily limited to) genetic mapping, transformation, gene isolation, gene expression, in situ hybridization, genetic diversity, and evolution.

If you are interested in presenting a brief synopsis of your work (15 - 20 minutes) please indicate your interest to me as soon as is convenient, or by October 1, 1999. This will allow timely scheduling of the talks prior to the PAG8 abstract deadline of October 15, 1999. Talks discussing poster presentations are welcome and encouraged. In the event that too many talks are offered for our allotted time, an ad hoc panel of previous speakers will arbitrate the selection.

The PAG8 preliminary program can be found at http://www.intl-pag.org/pag/pag8.html. Information about the meetings can be obtained at http://www.intl-pag.org or pag@scherago.com. Otherwise contact:

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P.S. - I do not plan on distributing a hard-copy announcement this year. If you are aware of anyone who may be interested in attending, please forward this announcement to them. I am sure that my e-mailing list is incomplete.

Thank you for your interest and we look forward to seeing you there.

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Appendix 1

USDA-ARS NPGS Beta Plant Introduction Evaluations 1998

Cooperative Evaluation of the USDA-ARS, National Plant Germplasm Systems's *Beta* Germplasm Collection coordinated by the Sugar Beet CGC

USDA-ARS NPGS *BETA* PLANT INTRODUCTION EVALUATIONS 1998

Cooperative Evaluation of NPGS *Beta* Germplasm coordinated by the Sugar Beet CGC

Thirty accessions were evaluated in 1998. Funding was provided by a grant from the USDA-ARS National Plant Germplasm System (NPGS). The diseases listed below have a serious impact on sugar beets grown in this country. The Sugar Beet Crop Germplasm Committee (CGC) coordinated the work of the cooperators listed below. The NPGS *Beta* Collection was transferred to the Western Regional Plant Introduction Station (W-6) at Pullman in 1995, and the Sugar Beet CGC has been working closely with the station personnel to assure that data are quickly entered into the GRIN database. Results from all of the tests have been forwarded to Pullman for entry into GRIN.

Evaluator	Location	Descriptor
J. Kern	Moorhead, MN	Agronomic Characters
R. Lewellen	Salinas, CA	Morphological Characters
R. Lewellen	Salinas, CA	Rhizomania
L. Panella	Fort Collins, CO	Cercospora
L. Panella	Fort Collins, CO	Rhizoctonia
J.S. Armstrong	Fargo, ND	Root Maggot
C. Rush	Bushland, TX	Fusarium
C. Rush	Bushland, TX	Aphanomyces
J. Michels	Bushland, TX	Root Aphids
S. Hafez	Parma, ID	Nematode
R. Lewellen	Salinas, CA	yellowing viruses
T. Brown (BSDF)	Twin Falls, ID	curly top virus

1998 CGC Evaluations of NPGS PIs for Resistance to Sugar Beet Cyst Nematode

S. Hafez, M. Larkin, R. Portenier and K. Hara
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Thirty sugar beet (*Beta vulgaris*) PI Accessions were evaluated for resistance to the beet cyst nematode (*Heterodera schachtii*) in 1998. Sugar beet seeds were planted 12 May in the greenhouse in 500 cm^3 pots containing naturally infested beet cyst nematode soil (5.3 eggs and larvae per 1 cm^3 soil). The PI accessions were compared to the susceptible check, HM WSPM9. Experimental design was randomized block with five replications. Sugar beet seedlings were separated from soil eight weeks after planting (09 Jul). Beet cyst nematode females and cysts were enumerated from the roots and soil. An analysis of variance was performed on the data, and mean separation was computed using the least significant difference. A numeric score of 0 to 9 was assigned to each PI accession (0 = immune, 9 = highly susceptible).

Beet Cyst Nematode (females & cyst count) data and analysis from 1998 test.

PI Accession	Roots		Soil		Total		Score[1]
NSL 81098	45	abcdefg	342	a	387	a	9
PI 386209	55	abc	319	ab	374	ab	9
PI 386206	44	abcdefg	307	abc	351	abc	9
HM WSPM9	52	abcd	286	abcd	338	abcd	9
NSL 93279	30	cdefgh	285	abcd	315	abcde	9
PI 232892	33	bcdefgh	270	abcde	303	abcde	8
PI 491195	50	abcde	241	abcdef	291	abcdef	8
PI 357359	67	a	221	bcdefg	288	abcdef	8
PI 486360	34	bcdefgh	249	abcde	283	abcdefg	8
PI 355961	46	abcdef	227	abcdefg	273	abcdefgh	8
PI 264152	47	abcdef	226	abcdefg	273	abcdefgh	8
PI 286501	59	ab	212	bcdefg	271	abcdefgh	8
PI 285592	38	bcdefgh	232	abcdefg	270	abcdefgh	8
PI 535839	44	abcdefg	209	bcdefg	253	bcdefghi	7
PI 490993	51	abcde	200	cdefg	251	bcdefghi	7
PI 142815	47	abcdef	193	cdefg	240	cdefghi	7
PI 486356	59	ab	177	defg	236	cdefghi	7
NSL 80223	45	abcdef	186	defg	231	cdefghi	6
PI 263865	42	abcdefgh	188	defg	230	cdefghi	6
PI 368376	48	abcde	182	defg	230	cdefghi	6
PI 286502	24	efgh	202	bcdefg	226	cdefghi	6
PI 269309	43	abcdefg	177	defg	220	defghi	6
PI 142813	29	cdefgh	187	defg	216	defghi	6
NSL 93277	19	fgh	193	cdefg	212	defghi	6
NSL 95217	27	defgh	183	defg	210	defghi	6
PI 357357	46	abcdef	157	efg	203	efghi	6
PI 357354	31	cdefgh	131	fg	162	fghi	4
PI 232894	34	bcdefgh	120	g	154	ghi	4

Beet Cyst Nematode (females & cyst count) data and analysis from 1998 test.

PI Accession	Roots		Soil		Total		Score[1]
PI 142809	30	cdefgh	120	g	150	hi	4
PI 507849	17	gh	122	g	139	i	4
PI 142808	14	i	117	g	131	i	3
LSD (0.05)	28		117		130		

[1] Score: 0 = immune, 9 = highly susceptible to beet cyst nematode.

1998 CGC Evaluations of NPGS PIs for Resistance to Sugar Beet Root Maggot

Scott Armstrong and Bob Dregseth
North Dakota State University, Department of Entomology, Fargo, ND
and
Larry Campbell - USDA- ARS Sugar Beet Laboratory, Fargo, ND

Screening for sugar beet root maggot (SBRM), *Tetanops myopaeformis* von Roder resistance remains an important strategy in developing pest management options that reduce feeding injury and yield loss in Red River Valley sugar beets. The resistance trial has been planted and evaluated near St. Thomas, ND because of a consistent population of SBRM in the area.

Materials and Methods

On May 13, 1998, forty entries of sugar beet seed were planted in single, 35 foot rows, replicated four times in a randomized block. Thirty of the accessions were included from the USDA-ARS NPGS *Beta* collection provided by Dr. Alan Hodgdon, USDA-ARS Pullman, WA, while the remaining ten were included from lines that Dr. Larry Campbell has been developing in his breeding program. Maribo 9363 (A) and (B) were included as a susceptible checks. There is no difference in the designation of Maribo A or B. It was included two times to use as an additional indicator of rating variability or variability in the feeding populations of SBRM. On 20 July, 1998, the number of established plants/35 linear row foot were counted and converted to the number of plants per 100 row feet. On 8 August, ten beets from each entry were removed from the ground by shovel, washed with water and brushes, and given a damage rating from 0 - 9 (0 is no damage, 9 is a beet with over 3/4 of the surface area scared from SBRM feeding). Plant stand counts and damage ratings were analyzed using analysis of variance (AOV) with means seperated by least significant difference (LSD, P=0.05).

Results

Densities of SBRM populations were lower than expected for St. Thomas, as reflected by overall damage ratings and numbers caught on sitcky stakes surrounding the test plots. The highest mean damage rating was 4.8 (Table below) compared to 6.7 from last years evaluation. Entry PI 269309 had a slightly lower damage rating than F 1016, a SBRM-resistant line developed and released by Dr. Campbell. Entry PI 181718 (94NOO13) did not differ significantly from F 1016 in damage rating or plant stand counts. This is encouraging because entries that show lower damage ratings usually

have low plant stand counts. PI 142809 had a high plant stand count and was slightly lower, although not significantly from Maribo 9363 B in damage. PI 269309, PI 181718 (94NOO13), and PI 142809, should be considered for further SBRM resistance development based on damage ratings and plant stand counts.

Evaluation of Sugar Beet Root Maggot Resistance, St. Thomas , ND 1998.

Entry	Damage Rating		Plants/100 feet	
PI 269309	1.05	Q	70	M - Q
F-1016	1.58	Q - P	82	J - O
PI 181718 (94NOO13)	1.78	O-P	123	A - D
PI 142809	2.00	O- P	111	B - F
YELLOW	2.23	M - O	90	F - N
MARIBO 9363 (B)	2.30	M - O	143	A
PI 357354	2.32	M - O	73	L - Q
CIM (97N0134)	2.43	L - N	125	A - C
F- 1015	2.45	K - N	106	B - I
PI 535839	2.45	K - N	38	R - S
PI 179180 (94N0044)	2.55	K - N	97	E - L
PI 142808	2.65	I - M	106	B - I
PI 142815	2.65	I - M	117	B - E
PI 386209	2.75	I - M	108	B - H
PI 507849	2.93	I - G	73	L - Q
NSL 81098	2.98	I - L	105	B - I
PI 142813	2.98	I - L	61	O - R
PI 172730	2.98	I - L	71	M - Q
NSL 93277	3.03	F - K	125	A - D
MARIBO 9363 (A)	3.05	F - I	127	A - B
PI 486356	3.10	F - I	100	D - K
PI 546378	3.15	E - I	102	C - J
PI 486360	3.20	D - I	97	E - L
PI 232894	3.23	D - I	101	D - K
NSL 95217	3.28	D - H	110	D - H
PI 491195	3.30	D - H	53	P - S
PI 386206	3.30	D - H	91	F- N
PI 169020	3.33	D - H	77	J - P
CJM (97N0133)	3.35	D - G	124	A - D
PI 232892	3.35	D - G	35	S
PI 490993	3.35	D - G	91	F - N
NSL 80223	3.45	C - G	103	B - H
NSL 93279	3.48	C - G	76	K - P

Evaluation of Sugar Beet Root Maggot Resistance, St. Thomas , ND 1998.

Entry	Damage Rating		Plants/100 feet	
PI 546396	3.58	C - F	66	N - Q
PI 264152	3.70	C - E	93	E - M
PI 546534	3.75	C - D	85	H - O
PI 263865	3.98	B - C	50	Q - S
PI 368376	4.30	A - B	86	G - N
PI 546455	4.80	A	111	B - G
LSD, (0.05)	**0.599**		**25.01**	

1998 CGC Evaluations of NPGS PIs for Resistance Aphanomyces and Fusarium Root Rots

Dr. C. Rush
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The 1998 Beta germplasm test to evaluate resistance to *Aphanomyces* and *Fusarium* root rots was planted April 24th on land heavily infested with *Aphanomyces cochlioides* and *Fusarium oxysporum f. sp. betae.* Thirty accessions were entered into the evaluation and sugar beet cultivars 9155 and Ranger were included as tolerant and susceptible controls, respectively. Plots were single 25-foot rows and there were six replications for each entry arranged in a randomized block design. The research site was pre-irrigated and, after planting, an additional inch of water was applied by center pivot irrigation for emergence. For weed control, Betamix was applied at 2 pt/ac on May 11 and Lorsban was applied for insect control on May 29th. A lay-by treatment of Trifluralin, at a rate of 1 ½ pt/ac was applied June 18. A total of 25 inches of irrigation was applied during the growing season. Plots were harvested on September 21st and each plant given a disease rating for *Aphanomyces* and *Fusarium* root rot severity. Data were subjected to analysis of variance and LSD procedures for statistical analysis. Results are presented in the table below.

Results

Several factors impacted the disease evaluation this year. This was the first year we conducted the study under center pivot irrigation and the area where the plots were located had excessively high weed pressure. Stand establishment was difficult to achieve and our unfamiliarity with the irrigation system further complicated matters. Soon after we established a fairly good stand, weeds begin emerging and we applied Betamix. This herbicide treatment hurt some of the young seedlings. However, the main factor that impacted this year's evaluation was the drought. 1998 was the driest year on record, 30% drier than our previous record. The high temperatures and the 25 inches of applied irrigation resulted in soil conditions that were very conducive for disease development. Our disease tolerant control, 9155, that usually yields fairly well, had a disease rating of 5.6 and yielded 6,368 pounds total sucrose per acre. The susceptible cultivar Ranger had a disease

rating of 7.15 and produced 5,559 pounds of sugar. As shown in the table below, only four entries had disease ratings less than 6 and 22 had ratings ≥7. Thirteen entries had mean ratings higher than 8.3. Most of the beets in these accessions were dead by mid-August, and it was impossible to identify the primary pathogen responsible for the disease.

In years past, it has been possible to evaluate plants in each plot of individual accessions for infection by *Fusarium* and *Aphanomyces.* However, this year, disease was so severe and so early that these two diseases could not be distinguished. Ratings constitute an evaluation of the over all severity of the disease caused by a complex of pathogens. This complex, that includes primarily *Aphanomyces cochlioides* and *Fusarium oxysporum f. sp. betae,* is not uncommon for many beet growing areas in the Western United States. Although in previous years, we have been able to distinguish between infection by *Aphanomyces* and *Fusarium*, undoubtedly many beets were infected by both pathogens. The field evaluations for *Aphanomyces* and *Fusarium* root rot at Bushland are actually evaluating disease caused by the two pathogens. The committee must decide whether this evaluation is of value and whether it is acceptable or not. Evaluations were moved to the field from the greenhouse because we were never satisfied that greenhouse evaluations truly reflected how accessions would perform under disease pressure in the field.

Results of 1998 Beta germplasm evaluation for susceptibility to Aphanomyces and Fusarium root rots.

Entry	Disease Rating (0-9)	Range	Standard Deviation
PI232892	9.0	9-9	0.00
PI142809	9.0	9-9	0.00
PI263865	9.0	9-9	0.00
PI507849	9.0	9-9	0.00
PI491195	8.9	8-9	0.37
PI490993	8.8	8-9	0.40
PI269309	8.8	8-9	0.40
PI357354	8.7	8-9	0.51
PI142813	8.7	7-9	0.81
PI442069	8.5	7-9	0.83
NSL81098	8.5	8-9	0.54
PI264152	8.5	7-9	0.83
PI535839	8.5	7-9	0.83
PI368376	8.3	6-9	1.20
PI286501	8.2	7-9	0.98
PI486356	8.0	7-9	1.00
PI286502	7.8	7-9	0.75
PI486360	7.8	6-9	1.16
PI355961	7.7	6-9	1.21
PI285592	7.5	6-9	1.05
PI386209	7.5	3-9	2.25
PI232894	7.0	4-9	1.78

Results of 1998 Beta germplasm evaluation for susceptibility to Aphanomyces and Fusarium root rots.

Entry	Disease Rating (0-9)	Range	Standard Deviation
NSL80223	6.7	3-9	2.25
PI142815	6.7	3-9	2.42
PI357357	6.3	3-9	2.66
NSL93279	6.3	4-9	1.75
NSL95217	5.8	2-9	2.63
PI386206	5.5	3-8	2.07
NSL93277	5.2	2-8	2.40
PI357359	4.0	2-7	1.78
NSL9155	5.6	3-7	1.46
Ranger	7.2	4-9	1.46
LSD	1.35		

1998 CGC Evaluations of NPGS PIs for Resistance to *Cercospora beticola*

L. Panella
USDA-ARS Sugar Beet Research Unit, Fort Collin, CO

The nursery was planted on 35 acres of leased land near Windsor, CO. Randomized complete-block designs, with three replications were used to evaluate germplasm. Internal controls included a highly susceptible synthetic and a resistant check (FC 504/502-2//SP6322-0). The nursery was planted on April 29th. Fertilization was 75% of the soil test recommendation to minimize leaf growth, which can interfere with visual evaluations. Two-row plots were 12 feet long, with 22-inch row spacing and an 8 - to 10-inch within-row plant spacing. Inoculation was performed on July 6th and again on July 13th. Evaluations were made on August 25, September 3, and 8, with the peak of the epidemic occurring on or about the last date. The field was sprayed twice with Betamix Progress, Upbeet, and Stinger (May 27 and June 5) to control weeds. The field was thinned by hand and irrigated as necessary - it was a dry summer.

The 1998 leaf spot epidemic started strong and progressed rather slowly, but eventually became more severe by late August. We had a period of about one month right after inoculation, in which we had relatively high evening temperatures, which helped disease development. An analysis of variance (PROC ANOVA - SAS) on the disease indices (visual evaluation scores) determined that there were significant differences among entries (P=0.05) on all three dates. At our third evaluation, means of the resistant and susceptible internal controls were 3.2 and 5.3 (scale of 0-10), respectively, across the nursery. In 1997 (September 8), these means were 3.7 and 7.3, respectively. Means of contributor lines on September 8 ranged from 2.5-8.0, compared with 4.3-8.3 in the severe epidemic of 1997.

Experiment 2A, 1998. Cercospora Resistance Evaluation of USDA-ARS NPGS *Beta* PIs, Windsor CO, (Lee Panella)

Seed Source	Origin	subspecies	Donor's ID	Disease Index*		
				25 Aug	3 Sept	8 Sept
			$LSD_{P=0.05}$	0.92	1.29	1.09
821051H2	**United States**	***vulgaris***	**Resistant Check**	**3.0**	**3.3**	**3.5**
PI 263865	Greece	*vulgaris*		3.3	3.8	3.8
PI 546422	Greece	*maritima*	WB 254	3.0	3.3	4.0
NSL 80223	United States	*vulgaris*	RS-3	3.5	4.0	4.3
PI 491195	Greece	*vulgaris*	WP121	4.3	4.8	4.3
PI 535839	Poland	*vulgaris*	AJ-4	4.3	4.5	4.5
PI 486360	FSU	*vulgaris*	MS-line 57	4.5	4.8	4.5
PI 442069	Spain	*vulgaris*	Turkey	3.8	4.3	4.5
NSL 93277	Chile	*vulgaris*	A76-36	5.8	4.5	4.5
NSL 95217	Argentina	*vulgaris*	A77-46	5.0	4.8	4.5
PI 386206	Former Soviet Union	*vulgaris*	VNIS F-526	4.5	4.3	4.8
NSL 93279	Chile	*vulgaris*	A76-38	5.0	4.8	4.8
PI 368376	Macedonia	*vulgaris*	Krusevska	4.0	4.3	4.8
PI 486356	Former Soviet Union	*vulgaris*	Pervomajskaja 028	4.8	4.8	4.8
PI 357354	Macedonia	*vulgaris*	Kocansko	4.5	4.8	5.0
NSL 81098	United States	*vulgaris*	RS-1	4.5	4.3	5.0
PI 504185	Italy	*maritima*	Wild beet	3.0	4.0	5.0
931002	**United States**	***vulgaris***	**Suscept. Check**	**5.3**	**5.0**	**5.0**
PI 507849	Hungary	*vulgaris*	3700002	3.8	4.8	5.0
PI 232894	Hungary	*vulgaris*	242-53 127	4.5	4.5	5.3
PI 232892	Hungary	*vulgaris*	242/C	5.0	5.0	5.3
PI 257280	Spain	*vulgaris*		4.5	4.5	5.3
PI 386209	Former Soviet Union	*vulgaris*	N 7776	4.0	4.3	5.3
PI 504173	Italy	*vulgaris*	Leaf beet	3.0	5.0	5.5
PI 490993	Turkey	*vulgaris*	WP 050	5.3	5.0	5.8
PI 164172	India	*vulgaris*	Palak	3.8	4.0	5.8
PI 116808	India	*vulgaris*	Palag	3.8	3.5	6.0
PI 546396	Turkey	*maritima*	WB 146	5.5	5.5	6.5
PI 142813	Iran	*vulgaris*	Choghondar	7.0	6.8	7.3
PI 142809	Iran	*vulgaris*	Choghondar	7.0	7.5	7.5
PI 546455	United States	*macrocarpa***	WB 157	8.0	7.5	7.8
PI 198413	Netherlands	*macrocarpa***	WB192B	6.8	8.0	8.0

*Disease Index (DI) scale = 0 (no symptoms) to 10 (plant death).

**Taxonomically, *Beta macrocarpa* is another species in the section *Beta* rather than a subspecies of *Beta vulgaris*.

1998 CGC Evaluations of NPGS PIs for Resistance to curly top virus

L. Panella & Terry Brown
USDA-ARS, Fort Collin, CO & BSDF, Kimberly ID

Thirty Plant Introductions (PIs) from the USDA-ARS National Plant Germplasm System (NPGS) (Garden Beet, Sugar Beet, Leaf Beet, Fodder Beet, and wild beet) were evaluated for

resistance to the beet curly top virus in an artificially inoculated nursery, managed by the Beet Sugar Development Foundation (BSDF) in Kimberly, ID. The field was planted on 8 and 9 Jun. Planting was late to maximize the number of viruliferous leafhoppers available to transfer to the sugar beets while they are in the 8- to 10-leaf stage. Plots were 12 ft long, two-rowed with 22 in between rows and replicated two times. They were planted with a cone planter. The plants were irrigated up with a solid set sprinkler system and watered for 6 hr twice a week. After the beets emerged, plots were trimmed to 8 ft in length, thinned to one foot between beets, and cultivated. Viruliferous leafhoppers were released on 15 Jul to cause an artificial epiphytotic. One week before the leafhoppers were released in the nursery, they had been transferred onto curly top-infested beets to assure that they were viruliferous when placed in the field. Uniform infection was achieved by placing 531 small cages, each with 175 to 200 leaf hoppers, uniformly throughout the field for release, and then spreading the leafhoppers daily for the next week by dragging a 12-foot tarp across the field. The field was sprayed with an insecticide on 23 Aug to kill the leafhoppers.

Plots were visually evaluated and rated on a Disease Index (DI) scale of 0 to 9 (no symptoms to dead) on 27 Aug and 16 Sep. An analysis of variance (PROC ANOVA - SAS) on the disease indices (visual evaluation scores) determined that there were no significant differences (P=0.05) among entries on both dates. Infection was milder and less uniform than in some years, and two replications were inadequate to separate differences among lines. There were, however, a number of accessions that performed very poorly, with a DI of 6 or greater. I would like to express my appreciation to the BSDF, which funded this research trial and to Mr. Terry Brown of the BSDF, who managed the nursery and helped with the evaluations.

1998 BSDF curly top nursery screening of the USDA-ARS NPGS *Beta* PIs, Kimberly ID.

				Disease Index*	
Seed Source	**Origin**	**subspecies**	**Donor's ID**	**08/27/98**	**09/16/98**
911032	**United States**	***vulgaris***	**FC718 - Susceptible Check .**	**3.8**	**4.3**
94A068	**United States**	***vulgaris***	**Beta G6040 - Resistant Check**	**3.5**	**4.5**
NSL 93277	Chile	*vulgaris*	A76-36	3.5	4.5
PI 535839	Poland	*vulgaris*	AJ-4	3.8	4.5
NSL 80223	United States	*vulgaris*	RS-3	3.8	4.8
NSL 81098	United States	*vulgaris*	RS-1	4.3	5.0
PI 504180	France	*vulgaris*	Wild beet	4.0	5.3
PI 357354	Macedonia	*vulgaris*	Kocansko	4.0	5.3
PI 507849	Hungary	*vulgaris*	3700002	4.3	5.3
PI 442069	Spain	*vulgaris*		3.8	5.3
NSL 95217	Argentina	*vulgaris*	A77-46	4.3	5.5
NSL 93279	Chile	*vulgaris*	A76-38	4.0	5.5
PI 269309	Sweden	*vulgaris*	Good for all Rikssort	4.5	5.5
PI 142815	Iran	*vulgaris*	Choghondar	4.0	5.5
PI 286502	Poland	*vulgaris*	Poli-O	4.0	5.5
PI 386209	Former Soviet Union	*vulgaris*	N7776	4.0	5.5
PI 285592	Poland	*vulgaris*	Crassa Strzelecki I Har	4.3	5.8
PI 142808	Iran	*vulgaris*	No.7352	4.3	5.8
PI 368376	Macedonia	*vulgaris*	Krusevska	4.5	5.8
PI 355961	Hungary	*vulgaris*	Beta242/52	4.3	5.8
PI 486356	Former Soviet Union	*vulgaris*	Pervomajskaja 028	4.0	5.8

1998 BSDF curly top nursery screening of the USDA-ARS NPGS *Beta* PIs, Kimberly ID.

				Disease Index*	
Seed Source	Origin	subspecies	Donor's ID	08/27/98	09/16/98
PI 386206	Former Soviet Union	*vulgaris*	VNISF-526	4.5	6.0
PI 486360	Former Soviet Union	*vulgaris*	MS-line 57?	4.8	6.0
PI 142813	Iran	*vulgaris*	Choghondar	4.5	6.0
PI 286501	Poland	*vulgaris*	Poly Monolhar	4.8	6.3
PI 169020	Turkey	*vulgaris*	Pazi	4.8	6.3
PI 142809	Iran	*vulgaris*	Choghondar	4.5	6.3
PI 264152	Ireland	*vulgaris*	IREL	4.8	6.3
PI 357357	Macedonia	*vulgaris*	Okrugla	5.0	6.3
PI 490993	Turkey	*vulgaris*	WP050	5.3	6.5
PI 263865	Greece	*vulgaris*		5.3	6.5
PI 491195	Greece	*vulgaris*	WP121	5.5	6.8

*Disease Index (DI) scale = 0 (no symptoms) to 9 (plant death).

1998 CGC Evaluations of NPGS PI
Sugar Beet Root Aphid

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Materials and Methods

Each entry was replicated 15 times. Three seeds of each entry were planted in 4-inch square pots using a 2:1 topsoil: sand mix. After germination, each pot was reduced to one healthy plant. These plants were allowed to grow until they reached the four true leaf stage. Each pot was then infested with five sugar beet root aphids. Aphids used for infesting the plants were taken from a bulk greenhouse culture reared *Chenopodium quinoa*. Potted, infested plants were arranged randomly in groups of three in flats with a row of empty pots separating each group of three. Greenhouse temperature was approximately 20°C and plants were manually watered as needed to keep the soil moist and prevent aphids from drowning before colonies established. Plants were allowed to grow undisturbed for six weeks. After six weeks the infestations were evaluated. Plants were removed from the pots, and the severity of the infestation was determined by floating aphids out of the root mass in 12 cm diameter x 8 cm deep bowls filled with water. Level of infestation was rated between 1-4 for each plant. Classifications are as follows: 1 - no nymphs or adults present; 2 - nymphs present, no adults present; 3 - nymphs present, few adults present; 4 - nymphs present, many adults present. Aphids were classified as adult using the presence of the sub-genital plate as an indicator of maturity.

In order to have standard comparisons, the evaluation included 15 replications of 'Ranger' and 'ACH205' repeated twice as resistant and susceptible controls, respectively. The results of the 1-4 rating system were converted to a 1-9 system for reporting purposes. None of the entries in this experiment seemed to be resistant to the sugar beet root aphid. In the field, the entries may host fewer aphids than in a controlled greenhouse experiment, however, all would support sugar beet root aphid reproduction and development, since all approached or exceeded a rating of 3.0 on our 1-4

scale. ACH205 and Ranger results were typical of those found in previous experiments, indicating that the aphid source was consistent with previous experiments.

Sugar Beet Root Aphid Host Plant Resistance Research 1998.

TAES Test Number: 98-4

Entry #	USDA Entries Variety Name	1-4 scale Average	Std. Dev.	Conversion to 1- 9 scale
68	RANGER	1.13	0.52	2.55
55	PI 142809	2.80	0.68	6.30
56	PI 142813	2.93	0.70	6.60
60	PI 263865	3.07	0.88	6.90
61	PI 269309	3.13	1.06	7.05
63	PI 285592	3.20	0.68	7.20
64	PI 286501	3.20	0.77	7.20
54	PI 142808	3.27	0.80	7.35
57	PI 142815	3.53	0.52	7.95
59	PI 232894	3.53	0.64	7.95
62	PI 264152	3.53	0.64	7.95
67	ACH 205	3.53	0.52	7.95
58	PI 232892	3.60	0.74	8.10
66	ACH 205	3.60	0.51	8.10
65	PI 286502	3.67	0.62	8.25
52	NSL 95217	3.80	0.41	8.55
53	NSL 93277	3.87	0.35	8.70
51	NSL 93279	4.00	0.00	9.00

Date Evaluated: 09/17
Date Planted: 05/18
Date Replanted: 06/12
Transplanted: 07/10
Date Infested (1st): 08/12
Date Infested (2nd): 08/27

1998 CGC Evaluations of NPGS PIs for Resistance to *Rhizoctonia solani*

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The nursery was planted on 35 acres of leased land near Windsor, CO. Randomized, complete-block designs with five replicates were used to evaluate Fort Collins ARS breeding germplasm. Rhizoctonia-resistant line FC703 and highly susceptible FC901/C817//413 were included as internal controls, along with highly resistant FC705-1.

One-row plots, planted May 21st, were 12 feet long with 22 inches between rows and 8-10 inches within-row spacing. Inoculation with dry, ground, barley-grain inoculum of *Rhizoctonia solani* isolate R-9 was performed on July 20; immediately after inoculation, a cultivation was performed so as to throw soil into the beet crowns. The field was sprayed twice with Betamix Progress, Upbeet, and Stinger (May 27 and June 5) to control weeds. The field was thinned by hand and irrigated as necessary - it was a dry summer. Any additional weed control was by hand hoeing and the plots were thinned to 8 in spacing between beets starting about 6 wk after planting.

Beets were harvested August 19 through 21. Each root was rated for rot on a scale of 0 to 7 (dead) as previously described. ANOVAs were performed on disease indices (DIs), percent healthy roots (classes 0 and 1 combined), and percentage of roots in classes 0 thru 3 (those most likely to be harvested and taken to the factory). Percentages were transformed to arcsin-square roots to normalize the data for analyses ("AP 0-1" and "AP 0-3" in the accompanying table). LSDs (P = 0.05) are provided for comparing DIs and arcsin transformations among entries and with our internal checks.

The 1998 Rhizoctonia epidemic started strong and progressed quickly, becoming severe by mid August. We had to irrigate the beets up and had a period of cold temperature with just a little rain in the week after planting. Therefore, stands were poor, and, in some instances, we lost plots to lack of germination and crusting. Differences in DIs among entries in all tests were highly significant ($P < 0.0001$). Mean DIs across all tests for highly resistant FC705-1, resistant FC703, and highly susceptible FC901 controls were 4.4, 3.4, and 5.7, respectively. Percentages of healthy roots were 12.7, 25.8, and 0.0 for these controls. Percentages of roots in disease classes 0 thru 3 were 29.72, 56.6, and 3.6, respectively. The highest and lowest DIs for contributor lines were 7.0 and 3.5, respectively.

Experiment 2R, 1998. Rhizoctonia Resistance Evaluation of USDA-ARS NPGS *Beta* PIs, Windsor CO, (Lee Panella)

Seed Source	Origin	subspecies	Donor's ID	DI	% 0-1[1]	% 0-3[1]	AP 0-1[1]	AP 0-3[1]
			$LSD_{P=0.05}$	**1.1**			**11.2**	**17.9**
PI 504173	Italy	*vulgaris*	Leaf beet	3.5	44	60	45	54
751080H	**United States**	***vulgaris***	**Resistant Check .....**	**3.5**	**31**	**44**	**34**	**42**
831083*	**United States**	***vulgaris***	**Highly Resistant Check**	**4.5**	**0**	**33**	**0**	**29**
PI 264152	Ireland	*vulgaris*	IREL	4.9	2	15	4	19

Experiment 2R, 1998. Rhizoctonia Resistance Evaluation of USDA-ARS NPGS *Beta* PIs, Windsor CO, (Lee Panella)

Seed Source	Origin	subspecies	Donor's ID	DI	% 0-1[1]	% 0-3[1]	AP 0-1[1]	AP 0-3[1]
			$LSD_{P=0.05}$	**1.1**			**11.2**	**17.9**
PI 368376	Macedonia	*vulgaris*	Krusevska	5.0	18	35	21	36
PI 357354	Macedonia	*vulgaris*	Kocansko	5.0	10	37	12	35
931017	**United States**	***vulgaris***	**Susceptible Check**	**5.3**	**0**	**0**	**0**	**0**
PI 486360	Former Soviet Union	*vulgaris*	MS-line 57 ?	5.4	2	4	4	5
PI 232894	Hungary	*vulgaris*	242-53 127	5.7	0	0	0	0
PI 546378	United States	*maritima*	WB 4	5.7	14	22	15	24
PI 491195	Greece	*vulgaris*	WP121	5.8	8	15	12	16
PI 504185	Italy	*maritima*	Wild beet	5.8	16	18	22	23
PI 142813	Iran	*vulgaris*	Choghondar	5.9	0	3	0	4
NSL 81098	United States	*vulgaris*	RS-1	5.9	6	16	7	17
PI 486356	Former Soviet Union	*vulgaris*	Pervomajskaja 028	5.9	0	0	0	0
PI 269309	Sweden	*vulgaris*	Good for all Rikssort	6.0	0	9	0	8
PI 263865	Greece	*vulgaris*		6.0	0	3	0	5
PI 285592	Poland	*vulgaris*	Crassa Strzelecki I Har	6.0	0	12	0	13
PI 286502	Poland	*vulgaris*	Poli-O	6.1	0	0	0	0
NSL 95217	Argentina	*vulgaris*	A77-46	6.2	0	4	0	5
PI 286501	Poland	*vulgaris*	Poly Mono Ihar	6.2	0	0	0	0
NSL 93277	Chile	*vulgaris*	A76-36	6.3	0	8	0	13
PI 386209	Former Soviet Union	*vulgaris*	N 7776	6.3	3	3	4	4
PI 535839	Poland	*vulgaris*	AJ-4	6.3	0	0	0	0
PI 546422	Greece	*maritima*	WB 254	6.3	4	12	5	16
PI 386206	Former Soviet Union	*vulgaris*	VNIS F-526	6.4	0	5	0	7
NSL 80223	United States	*vulgaris*	RS-3	6.4	0	7	0	11
PI 142809	Iran	*vulgaris*	Choghondar	6.4	0	7	0	9
NSL 93279	Chile	*vulgaris*	A76-38	6.5	0	0	0	0
PI 490993	Turkey	*vulgaris*	WP 050	6.5	5	5	7	7
PI 232892	Hungary	*vulgaris*	242/C	6.6	0	0	0	0
PI 507849[2]	Hungary	*vulgaris*	3700002	7.0	0	0	0	0
PI 198413[2]	Netherlands	*macrocarpa*[3]	WB192B	7.0	0	0	0	0

[1] DI = Disease Index on a scale of 0 (no damage) to 7 (plant death), % 0-1= percent healthy roots, % 0-3 those roots most likely to be harvested and taken to the factory. AP is the arcsin-square root transformation of percentages to normalize the data for analyses.

[2] PI 198413 was missing replication 2, PI 507849 was missing replications 1 and 2, and 831083 was missing replication 1 due to lack of emergence in the field.

[3] Taxonomically, *Beta macrocarpa* is another species in the section *Beta* rather than a subspecies of *Beta vulgaris*.

Dec 14, 1998 10:48
Version 98.1d

AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER
CGC Agronomic Evaluation
Trial 988531, Moorhead MN
Planting Date: 05/28/98 Harvest Date: 10/24/98
34 Entries 4 Replications 1 Rows/Plot 2 Samples/Plot

Entry		Source	Rec/T (lbs)			Rec/A (lbs)			Loss to Mol.		
			Mean	%	P-val	Mean	%	P-val	Mean	%	P-val
*CC1093.XG001	CC1093.XG001	8000461	193.20	81	0.00	2315.57	66	0.00	2.61	115	0.00
*CC4235.KQ002	CC4235.KQ002	9640003	250.64	105	0.10	3215.37	92	0.23	2.22	98	0.52
*CD1086.CH035	CD1086.CH035	9640007	273.56	115	0.00	4081.82	117	0.01	2.00	88	0.00
*CD1096.XH016	CD1096.XH016	9500121	235.10	99	0.69	4363.59	125	0.00	2.23	98	0.56
PI 142808	PI 142808	IRAN	77.57	33	0.00	1087.63	31	0.00	3.04	134	0.00
PI 142809	PI 142809	IRAN	46.04	19	0.00	924.44	26	0.00	2.82	125	0.00
PI 142813	PI 142813	IRAN	71.90	30	0.00	1393.35	40	0.00	2.89	128	0.00
PI 142815	PI 142815	IRAN	102.97	43	0.00	1655.77	47	0.00	2.91	129	0.00
PI 169020	PI 169020	TURKEY	88.08	37	0.00	1150.95	33	0.00	2.77	122	0.00
PI 172730	PI 172730	TURKEY	112.54	47	0.00	1128.59	32	0.00	3.15	139	0.00
PI 232892	PI 232892	HUNGARY	237.67	100	0.96	2829.47	81	0.03	2.40	106	0.13
PI 232894	PI 232894	HUNGARY	228.96	96	0.34	3839.23	110	0.25	2.32	103	0.50
PI 269309	PI 269309	SWEDEN	12.47	5	0.00	132.20	4	0.00	2.57	114	0.00
PI 285592	PI 285592	POLAND	32.68	14	0.00	1120.92	32	0.00	2.65	117	0.00
PI 286501	PI 286501	POLAND	197.91	83	0.00	3280.25	94	0.48	2.59	114	0.00
PI 286502	PI 286502	POLAND	222.08	93	0.10	3415.59	98	0.79	2.39	106	0.15
PI 355961	PI 355961	HUNGARY	218.56	92	0.05	3601.79	103	0.72	2.46	109	0.02
PI 357354	PI 357354	MACEDONIA	0.00	0	0.00	0.00	0	0.00	2.55	113	0.00
PI 357357	PI 357357	MACEDONIA	4.50	2	0.00	29.38	1	0.00	2.60	115	0.00
PI 368376	PI 368376	MACEDONIA	105.12	44	0.00	1326.33	38	0.00	2.82	124	0.00
PI 486356	PI 486356	SOVIET U	201.41	85	0.00	3320.86	95	0.56	2.49	110	0.01
PI 486360	PI 486360	SOVIET U	206.50	87	0.00	2671.96	76	0.01	2.51	111	0.01
PI 490993	PI 490993	TURKEY	0.00	0	0.00	0.00	0	0.00	2.36	104	0.28
PI 491195	PI 491195	GREECE	59.71	25	0.00	784.48	22	0.00	2.94	130	0.00
NSL 80223	NSL 80223	USA	169.16	71	0.00	964.55	28	0.00	2.90	128	0.00
NSL 81098	NSL 81098	USA	163.77	69	0.00	2370.72	68	0.00	2.47	109	0.02
NSL 93277	NSL 93277	CHILE	157.06	66	0.00	2943.82	84	0.07	3.04	134	0.00
NSL 93279	NSL 93279	CHILE	149.39	63	0.00	2044.37	59	0.00	2.95	130	0.00
NSL 95217	NSL 95217	ARGENTINA	159.21	67	0.00	1950.34	56	0.00	2.85	126	0.00
PI 386206	PI 386206	SOVIET U	157.74	66	0.00	2205.11	63	0.00	3.07	135	0.00
PI 386209	PI 386209	SOVIET U	205.42	86	0.00	3364.23	96	0.67	2.54	112	0.00

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Entry		Source	Rec/T (lbs)			Rec/A (lbs)			Loss to Mol.		
			Mean	%	P-val	Mean	%	P-val	Mean	%	P-val
PI 507849	PI 507849	HUNGARY	112.07	47	0.00	368.89	11	0.00	2.55	113	0.00
PI 535839	PI 535839	POLAND	222.95	94	0.12	4574.70	131	0.00	2.27	100	0.92
PI 357359	PI 357359	MACEDONIA	101.05	42	0.00	82.47	2	0.00	2.71	120	0.00
Check Mean			238.12			3494.09			2.27		
Coeff. of Var. (%)			12.36			26.66			5.86		
F Value			91.31**			26.64**			13.26**		
Mean LSD (0.05)			24.20	10		753.00	22		0.22	10	
Mean LSD (0.01)			32.04	13		996.71	29		0.29	13	

* Significant at 5%. ** Significant at 1%. ns Not significant.
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Mean LSD is only appropriate for comparing entry means with each other when F value is significant.

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Entry		Source	Yield (T/A)			Sugar %			Na (ppm)		
			Mean	%	P-val	Mean	%	P-val	Mean	%	P-val
*CC1093.XG001	CC1093.XG001	8000461	12.05	83	0.04	12.27	87	0.00	926.55	125	0.00
*CC4235.KQ002	CC4235.KQ002	9640003	12.81	88	0.15	14.75	104	0.09	545.22	74	0.00
*CD1086.CH035	CD1086.CH035	9640007	14.90	102	0.78	15.68	111	0.00	609.32	82	0.03
*CD1096.XH016	CD1096.XH016	9500121	18.48	127	0.00	13.98	99	0.58	879.02	119	0.02
PI 142808	PI 142808	IRAN	14.13	97	0.78	6.92	49	0.00	1495.65	202	0.00
PI 142809	PI 142809	IRAN	20.33	140	0.00	5.13	36	0.00	1725.60	233	0.00

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AMERICAN CRYSTAL SUGAR COMPANY RESEARCH CENTER
CGC Agronomic Evaluation
Trial 988531, Moorhead MN
Planting Date: 05/28/98 Harvest Date: 10/24/98
34 Entries 4 Replications 1 Rows/Plot 2 Samples/Plot

Entry		Source	Yield (T/A)			Sugar %			Na (ppm)		
			Mean	%	P-val	Mean	%	P-val	Mean	%	P-val
PI 142813	PI 142813	IRAN	19.38	133	0.00	6.48	46	0.00	1722.00	233	0.00
PI 142815	PI 142815	IRAN	15.99	110	0.35	8.06	57	0.00	1173.77	159	0.00
PI 169020	PI 169020	TURKEY	13.04	90	0.32	7.17	51	0.00	1179.00	159	0.00
PI 172730	PI 172730	TURKEY	10.65	73	0.01	8.78	62	0.00	1166.80	158	0.00
PI 232892	PI 232892	HUNGARY	11.86	81	0.08	14.28	101	0.80	686.57	93	0.48
PI 232894	PI 232894	HUNGARY	16.89	116	0.13	13.77	97	0.37	895.95	121	0.04
PI 269309	PI 269309	SWEDEN	13.56	93	0.52	3.20	23	0.00	1354.45	183	0.00
PI 285592	PI 285592	POLAND	34.43	236	0.00	4.28	30	0.00	1757.25	237	0.00
PI 286501	PI 286501	POLAND	16.58	114	0.19	12.49	88	0.00	1089.82	147	0.00
PI 286502	PI 286502	POLAND	15.63	107	0.49	13.50	95	0.13	861.85	116	0.11
PI 355961	PI 355961	HUNGARY	16.41	113	0.23	13.39	94	0.08	823.65	111	0.27
PI 357354	PI 357354	MACEDONIA	13.48	93	0.49	2.40	17	0.00	1064.67	144	0.00
PI 357357	PI 357357	MACEDONIA	16.04	110	0.34	2.82	20	0.00	1366.12	185	0.00
PI 368376	PI 368376	MACEDONIA	12.59	86	0.20	8.07	57	0.00	1001.75	135	0.00
PI 486356	PI 486356	SOVIET U	16.83	116	0.14	12.56	89	0.00	793.80	107	0.48
PI 486360	PI 486360	SOVIET U	12.92	89	0.29	12.84	91	0.00	933.50	126	0.01
PI 490993	PI 490993	TURKEY	1.00	7	0.00	1.00	7	0.00	800.00	108	0.43
PI 491195	PI 491195	GREECE	12.91	89	0.29	5.92	42	0.00	1900.50	257	0.00
NSL 80223	NSL 80223	USA	5.73	39	0.00	11.35	80	0.00	775.52	105	0.64
NSL 81098	NSL 81098	USA	14.04	96	0.73	10.66	75	0.00	1052.52	142	0.00
NSL 93277	NSL 93277	CHILE	18.77	129	0.01	10.89	77	0.00	1022.12	138	0.00
NSL 93279	NSL 93279	CHILE	14.02	96	0.72	10.42	73	0.00	1062.00	144	0.00
NSL 95217	NSL 95217	ARGENTINA	12.56	86	0.20	10.81	76	0.00	1059.80	143	0.00
PI 386206	PI 386206	SOVIET U	13.99	96	0.71	10.95	77	0.00	1061.57	143	0.00
PI 386209	PI 386209	SOVIET U	16.59	114	0.19	12.81	90	0.00	805.60	109	0.39
PI 507849	PI 507849	HUNGARY	3.31	23	0.00	8.16	58	0.00	1447.22	196	0.00
PI 535839	PI 535839	POLAND	20.30	139	0.00	13.42	95	0.09	980.62	133	0.00
PI 357359	PI 357359	MACEDONIA	0.90	6	0.00	7.76	55	0.00	1309.10	177	0.00
Check Mean			14.56			14.17			740.03		
Coeff. of Var. (%)			19.41			8.18			12.38		
F Value			18.59**			103.57**			24.54**		
Mean LSD (0.05)			3.87	27		1.10	8		190.65	26	
Mean LSD (0.01)			5.12	35		1.46	10		252.36	34	

* Significant at 5%. ** Significant at 1%. ns Not significant.
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CGC Agronomic Evaluation
Trial 988531, Moorhead MN
Planting Date: 05/28/98 Harvest Date: 10/24/98
34 Entries 4 Replications 1 Rows/Plot 2 Samples/Plot

Entry		Source	K (ppm)			Am.N (ppm)			Bolters %		
			Mean	%	P-val	Mean	%	P-val	Mean	%	P-val
*CC1093.XG001	CC1093.XG001	8000461	1935.62	100	0.92	1167.60	121	0.00	0.00		
*CC4235.KQ002	CC4235.KQ002	9640003	1953.12	101	0.62	1001.07	103	0.42	2.50		
*CD1086.CH035	CD1086.CH035	9640007	1900.52	98	0.49	818.45	85	0.00	0.00		
*CD1096.XH016	CD1096.XH016	9500121	1935.05	100	0.93	886.02	92	0.04	0.00		
PI 142808	PI 142808	IRAN	2786.45	144	0.00	1062.10	110	0.08	0.00		
PI 142809	PI 142809	IRAN	2357.40	122	0.00	924.30	95	0.40	0.00		
PI 142813	PI 142813	IRAN	2417.55	125	0.00	960.37	99	0.88	0.00		
PI 142815	PI 142815	IRAN	2576.25	133	0.00	1139.62	118	0.00	0.00		
PI 169020	PI 169020	TURKEY	2049.25	106	0.04	1165.25	120	0.00	28.00		
PI 172730	PI 172730	TURKEY	2405.07	125	0.00	1372.47	142	0.00	25.95		
PI 232892	PI 232892	HUNGARY	2175.82	113	0.00	1025.97	106	0.27	0.00		
PI 232894	PI 232894	HUNGARY	2403.70	124	0.00	831.97	86	0.01	0.63		
PI 269309	PI 269309	SWEDEN	2696.67	140	0.00	778.42	80	0.00	0.00		
PI 285592	PI 285592	POLAND	2580.75	134	0.00	715.90	74	0.00	0.00		
PI 286501	PI 286501	POLAND	2496.30	129	0.00	943.52	97	0.64	0.00		
PI 286502	PI 286502	POLAND	2329.60	121	0.00	915.15	95	0.31	0.00		
PI 355961	PI 355961	HUNGARY	2314.92	120	0.00	988.20	102	0.70	0.00		
PI 357354	PI 357354	MACEDONIA	2623.45	136	0.00	887.42	92	0.13	55.43		
PI 357357	PI 357357	MACEDONIA	2785.95	144	0.00	768.65	79	0.00	13.18		
PI 368376	PI 368376	MACEDONIA	1963.00	102	0.58	1290.25	133	0.00	0.00		
PI 486356	PI 486356	SOVIET U	2405.30	125	0.00	993.85	103	0.63	0.00		
PI 486360	PI 486360	SOVIET U	2328.65	121	0.00	983.00	102	0.78	0.75		
PI 490993	PI 490993	TURKEY	2000.00	104	0.23	1000.00	103	0.55	98.38		
PI 491195	PI 491195	GREECE	2347.00	122	0.00	951.25	98	0.75	21.23		

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Entry		Source	K (ppm)			Am.N (ppm)			Bolters %		
			Mean	%	P-val	Mean	%	P-val	Mean	%	P-val
NSL 80223	NSL 80223	USA	2137.45	111	0.00	1387.72	143	0.00	95.48		
NSL 81098	NSL 81098	USA	2215.30	115	0.00	934.07	96	0.51	71.53		
NSL 93277	NSL 93277	CHILE	2602.00	135	0.00	1286.22	133	0.00	17.13		
NSL 93279	NSL 93279	CHILE	2613.15	135	0.00	1194.90	123	0.00	51.75		
NSL 95217	NSL 95217	ARGENTINA	2338.10	121	0.00	1193.92	123	0.00	21.28		
PI 386206	PI 386206	SOVIET U	3031.17	157	0.00	1177.52	122	0.00	0.00		
PI 386209	PI 386209	SOVIET U	2203.57	114	0.00	1081.47	112	0.03	0.00		
PI 507849	PI 507849	HUNGARY	2416.17	125	0.00	802.30	83	0.00	60.88		
PI 535839	PI 535839	POLAND	2032.22	105	0.08	860.05	89	0.04	0.63		
PI 357359	PI 357359	MACEDONIA	2257.49	117	0.00	1014.39	105	0.38	94.43		
Check Mean			1931.08			968.29					
Coeff. of Var. (%)			4.37			9.22					
F Value			30.17**			13.78**					
Mean LSD (0.05)			143.58	7		131.25	14				
Mean LSD (0.01)			190.05	10		173.73	18				

* Significant at 5%. ** Significant at 1%. ns Not significant.
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Mean LSD is only appropriate for comparing entry means with each other when F value is significant.

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Entry		Source	Tare (%)		
			Mean	%	P-val
*CC1093.XG001	CC1093.XG001	8000461	6.43	95	0.60
*CC4235.KQ002	CC4235.KQ002	9640003	7.32	108	0.44
*CD1086.CH035	CD1086.CH035	9640007	7.83	115	0.13
*CD1096.XH016	CD1096.XH016	9500121	5.57	82	0.08
PI 142808	PI 142808	IRAN	5.07	75	0.06
PI 142809	PI 142809	IRAN	2.64	39	0.00
PI 142813	PI 142813	IRAN	2.50	37	0.00
PI 142815	PI 142815	IRAN	5.77	85	0.26
PI 169020	PI 169020	TURKEY	15.12	223	0.00
PI 172730	PI 172730	TURKEY	8.29	122	0.09
PI 232892	PI 232892	HUNGARY	5.52	81	0.16
PI 232894	PI 232894	HUNGARY	6.03	89	0.40
PI 269309	PI 269309	SWEDEN	1.69	25	0.00
PI 285592	PI 285592	POLAND	2.26	33	0.00
PI 286501	PI 286501	POLAND	5.58	82	0.18
PI 286502	PI 286502	POLAND	6.96	103	0.84
PI 355961	PI 355961	HUNGARY	6.78	100	0.99
PI 357354	PI 357354	MACEDONIA	6.81	100	0.98
PI 357357	PI 357357	MACEDONIA	3.23	48	0.00
PI 368376	PI 368376	MACEDONIA	15.01	221	0.00
PI 486356	PI 486356	SOVIET U	6.07	89	0.42
PI 486360	PI 486360	SOVIET U	5.30	78	0.10
PI 490993	PI 490993	TURKEY	5.00	74	0.05
PI 491195	PI 491195	GREECE	13.95	206	0.00
NSL 80223	NSL 80223	USA	6.89	102	0.91
NSL 81098	NSL 81098	USA	13.66	201	0.00
NSL 93277	NSL 93277	CHILE	10.55	155	0.00
NSL 93279	NSL 93279	CHILE	10.57	156	0.00
NSL 95217	NSL 95217	ARGENTINA	11.17	165	0.00
PI 386206	PI 386206	SOVIET U	6.65	98	0.88
PI 386209	PI 386209	SOVIET U	6.41	94	0.68
PI 507849	PI 507849	HUNGARY	11.42	168	0.00
PI 535839	PI 535839	POLAND	4.65	68	0.02
PI 357359	PI 357359	MACEDONIA	7.46	110	0.45

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Entry	Source	Tare (%)		
		Mean	%	P-val
Check Mean		6.78		
Coeff. of Var. (%)		22.04		
F Value		19.84**		
Mean LSD (0.05)		2.24	33	
Mean LSD (0.01)		2.96	44	

* Significant at 5%. ** Significant at 1%. ns Not significant.
2nd column for each trait is percent of check.
3rd column for trait is probability that detection of a diff. (from check mean) of this size is due to chance.
Mean LSD is only appropriate for comparing entry means with each other when F value is significant.

1997 CGC Evaluations of NPGS PI
Rhizomania, Virus Yellows, Agronomic and morphological Traits

Robert Lewellen
USDA-ARS Sugarbeet Research Unit
Salinas, CA

A test with three repetitions (Test 3298) was used to test 30 PI's and 4 checks for reaction to BNYVV (rhizomania), BWYV (virus yellows), and agronomic traits including root and sugar yield, type and end use, root and petiole color, and bolting tendency. The test was planted May 11, 1998 in the field under rhizomania infested conditions. Roots were not harvested. Natural infection by *Erysiphe polygoni* (powdery mildew) occurred and individual plots were scored.

Individual plants within each entry were scored for reactions to rhizomania based on a scale of 0 to 9, where a rating of 0 to 3 was considered resistant and 4 to 9 susceptible. 'RZM Resist %' is the percentage of plants that were rated between 0 and 3. No accession was found more resistant than the resistant checks. Because of very light virus yellows incidence, entries were not scored for virus yellows.

TEST 3298. EVALUATION OF PLANT INTRODUCTIONS, SALINAS, CA., 1998

48 entries x 4 replications, sequential
1-row plots, 11 ft. long

Planted: May 11, 1998
Not harvested for yield

Variety	Description	Stand Count	Harvest Count	RZM Resist	Powdery Mildew	End Use	Growth Habit	Bolt Tend	Root Color
		No.	No.	%	Score				
Checks									
US H11	rhizom. susc. check	21	20	19.2	7.0	5	1	2	1
R639	RZM R539 (resist. check)	20	21	82.1	4.3	5	1	2	1
97-SP22-0	Inc. SP7622-0 (VYS check)	21	23	32.8	6.5	5	1	2	1
R726	RZM-ER R526 (WB check)	22	22	76.2	6.0	5	1	2	1
Plant Introductions (Pullman)									
Beta vulgaris									
PI 142808	SD No. 7352	19	19	8.5	5.8	5	1	2	1,3,4
PI 142809	SD Choghondar	14	5	5.0	5.8	7	1	2	4
PI 142810	SD Choghondar	21	20	11.0	4.5	7	1	2	1
PI 142813	SD Choghondar	17	15	11.3	5.0	5	1	2	3,4
PI 169020	SD Pazi	16	14	8.9	5.8	7	1	3	4
PI 172730	SD No. 7425	16	13	25.4	5.5	3	1	3	1,3,4
PI 263865	SD	18	16	0.0	5.3	7	1	3	4
PI 264152	SD Irel	21	17	20.5	6.8	5	1	2	1
PI 269309	SD Good for all RIKS	20	18	8.5	6.3	2	1	2	4
PI 357354	SD Kocansko	20	16	7.8	5.5	7	1	3	4
PI 368376	SD Krusevska	21	19	10.9	6.0	5	4	2	1
PI 442069	SD	17	16	29.6	6.0	1	1	2	1
PI 486356	SD Pervomajskaja 028	20	21	13.5	6.5	5	1	2	1
PI 486360	SD MS-line 57?	22	22	21.5	6.5	5	1	2	1
PI 490993	SD WP 050	19	17	0.0	6.0	5	1	1	1
PI 491195	SD WP 121	16	18	3.9	5.0	7	1	3	1
PI 504173	SD Leaf beet	16	10	3.1	5.8	6	1	1	1

TEST 3298. EVALUATION OF PLANT INTRODUCTIONS, SALINAS, CA., 1998

(cont.)

Variety	Description	Stand Count	Harvest Count	RZM Resist	Powdery Mildew	End Use	Growth Habit	Bolt Tend	Root Color
		No.	No.	%	Score				
Beta vulgaris ssp. *vulgaris*									
NSL 80223	SD RS-3	20	17	6.8	6.0	6	1	1	1
NSL 81098	SD RS-1	18	16	4.6	4.8	7	1	3	1
NSL 93277	SD A76-36	19	19	4.0	5.8	7	1	3	1
NSL 93279	SD A76-38	20	19	9.0	5.5	7	1	3	1
NSL 95217	SD A77-46	19	19	8.6	5.8	7	1	3	1
Beta vulgaris ssp. *vulgaris*									
PI 386206	SD VNIS F-526	20	20	9.7	6.8	5	1	2	1
PI 386209	SD N 7776	20	20	14.9	5.8	5	1	2	1
PI 507849	SD 3700002	17	17	18.6	5.8	5	1	1	1
PI 535839	SD AJ-4	19	16	8.0	6.8	5	1	2	1
Beta vulgaris var. *cicla*									
PI 357359	SD Domasna	20	19	45.4	6.8	1	1	1	1
Beta vulgaris var. *maritima*									
PI 546378	SD WB 4	20	15	29.9	6.0	6	1	1	1
PI 546396	SD WB 146	16	15	7.9	5.5	6	1	1	1
PI 546422	SD WB 254	21	15	42.5	5.8	6	1	1	1
USDA entries (Multigerm lines)									
R727A	C37 x RZM *Bvm*-PI's	20	21	40.5	6.5				
R727B	Y569rr x RZM *Bvm*-PI's	22	25	50.1	4.8				
R728	RZM R328 (C79-4)	22	21	73.4	5.3				
Y775	Y-Rrr(C) x Y74(C)	22	21	70.7	5.0				
USDA entries (CLSR-*Rz*)									
R710	CR-RZM R509-#,R510-#(C)	18	18	84.1	5.5				
R709-1	CR-RZM R509A-1	21	22	76.0	4.8				
R709-9	CR-RZM R509A-9	20	18	82.4	6.0				
R710-10	CR-RZM R510A-10	16	15	72.4	4.8				
R710-14	CR-RZM R510A-14	13	12	70.6	7.0				

TEST 3298. EVALUATION OF PLANT INTRODUCTIONS, SALINAS, CA., 1998

(cont.)

Variety	Description	Stand Count	Harvest Count	RZM Resist	Powdery Mildew	End Use	Growth Habit	Bolt Tend	Root Color
		No.	No.	%	Score				
USDA entries (R22 monogerms)									
7818 Sp	RZM 6818mmaa x 848(C)	20	20	77.3	5.8				
7818-4	Inc. 6818B-4	23	21	57.4	4.5				
7818-14	T-O 6818B-14	21	21	66.8	5.3				
7818-22	Inc. 6818B-22	22	21	18.1	5.5				
7818-23	Inc. 6818B-23	23	20	13.9	6.3				
Mean		19.2	17.9	30.5	5.7				
LSD (.05)		3.0	3.9	16.4	0.9				
C.V. (%)		11.2	15.4	38.4	11.4				
F value		4.9**	6.9**	23.0**	4.5**				

NOTES:

END USE (Primary Use of Plant): 1 = chard; 2 = DDR-like; 3 = DDR,chard,spinach; 4 = fodder; 5 = sugar; 6 = wild beet type; 7 = mixed.

HABIT (general growth habit): 1 = erect; 2 = intermediate reading between 1 & 3; 3 = procumbent; 4 = intermediate reading between 3 & 5; 5 = prostrate (no more than 6" high).

BOLTING TENDENCY without cold induction: 1 = BB (annual) 100%; 2 = bb (biennial) 0%; 3 = B:bb(mixed) 1-99%.

ROOT COLOR (external color of root): 1 = white; 2 = yellow; 3 = orange; 4 = red.

RHIZOMANIA: 0 = immune; 1 = very resistant; 3 = resistant; 5 = intermediate; 7 = susceptible; 9 = highly susceptible.

POWDERY MILDEW: rated 0 to 9, where 9 = highly susceptible.

Appendix 2

Report of the USDA-ARS National Germplasm Resources Laboratory, July 1998

Report of the

National Germplasm Resources Laboratory

to the

Regional Technical Committees on Plant Germplasm

July 1998

Table of Contents

National Germplasm Resources Laboratory (NGRL) Programs - Allan K. Stoner

The programs of the National Germplasm Resources Laboratory (NGRL) support the mission of the National Plant Germplasm System (NPGS), which is: "To effectively collect, document, preserve, evaluate, enhance, and distribute plant genetic resources for continued improvement in the quality and production of economic crops." The NGRL activities are performed by the Plant Exchange Office (PEO), and the Germplasm Resources Information Network/Database Management Unit (GRIN/DBMU). In addition, the Laboratory has responsibility for facilitating the activities of the 40 Crop Germplasm Committees that provide technical advice to the NPGS.

The constant evolution of the GRIN hardware and software continues to make the database more useful to the NPGS maintenance sites and to the user community. Access to the GRIN data via the Internet has greatly increased the number of users viewing and downloading data about NPGS germplasm collections.

During the past year the PEO began several new projects to identify and prioritize the germplasm acquisition needs of the NPGS, to study *in situ* conservation of plant genetic resources and to apply the Geographical Information System (GIS) and computer mapping technologies.

Specific information of the Laboratory's activities is contained in the individual reports that follow. If you have questions or comments about any of the programs, please communicate them to me or to individuals involved.

Plant Exchange Office (PEO) - Ned Garvey

Exchanges

Maryann Loftus continues to forward to the appropriate NPGS site requests for germplasm received through GRIN's World Wide Web connection. As more researchers find our Web site the number of requests has increased to nearly 200 during calendar year 1997, while letter requests have dropped to only 35 for the year.

During 1997, 17,509 items in 392 shipments were forwarded to 65 different countries. Some 972 non-permit items were received from foreign cooperators for use by U.S. scientists.

Maryann continues to provide quarantine and shipping information to traveling scientists, plant collectors, and researchers, and assists returning collectors when clearing APHIS inspections at international airports.

Shipping Update

Walter Denny, APHIS-PPQ Inspector at the Beltsville Quarantine Center, retired on 30 April 1998. The remaining Inspector, Pamela Waterworth, is now handling all exports, imports, and post-entry duties. Pam's phone number is 301-504-7142 and FAX is 301-504-8539. Pam is currently keeping up with the workload, but should the sites have any perishable shipments which they need to send out, it would be advisable to contact either Pam or Maryann BEFORE sending the material to Beltsville as there is no one to replace Pam when she is on leave or attending training. At this time there are no plans to fill the other inspector's vacancy.

PI Documentation

Becky Norris continues to coordinate the documentation and assignment of PI numbers. 6,205 new PI numbers were assigned and the passport data reviewed. This includes 356 new Crop Science registrations and 1,480 PVP accessions. Approx. 731 CSR certificates were printed and distributed to the authors.

Becky continues to assist curators and site personnel with adding and updating passport data and work closely with DBMU personnel to standardize and correct records in the GRIN database.

Plant Inventory No. 206 for 1997 has been published. It is 2 parts and contains a total of 707

pages of text and indexes.

Becky is part of two DBMU committees, Quality Control and User Interface, providing feedback necessary for developing GRIN systems.

In Situ Conservation

Dr. Diane Pavek, a postdoc with PEO, is in the second year of a two-year ecogeographic survey of select grape species (*Vitis* spp.), native to North America. During 1997, she examined a total of 84 waterways and found rock grape (*Vitis rupestris* Scheele) on only 24 waterways in nine states. In collaboration with grape germplasm curator, Warren Lamboy, and horticulturist, Ned Garvey, molecular and morphological population data were evaluated, and seven populations were proposed as *in situ* preserves based on the differences in genetic variation. This summer Diane will collect 50 grapes from each established *in situ* preserve for mid-term seed storage and distribution to researchers and breeders. Currently, in cooperation with State and Federal agencies, two of the seven proposed *in situ* preserves have been established.

This summer, Diane located five populations of sweet mountain grape (*Vitis monticola* Buckl.), a Texas endemic found only on calcareous substrate, and four populations of Calloosa grape (*Vitis shuttleworthii* House), a Florida endemic. For each population, morphological data will be analyzed, and DNA extracted from leaf samples. These data are necessary to determine which populations are included as *in situ* preserves.

Plant Exploration

The USDA Plant Exploration Program is coordinated by Karen Williams and supported by Judi duCellier. One domestic and five foreign plant explorations were supported in FY 1997. An exploration for *Vigna angularis* in China originally scheduled for 1997 was postponed until the fall of 1998. In FY 1998, eight explorations and one exchange trip are being supported. An exploration for forage species and vegetables in Albania has been postponed until 1999 because of political unrest in the country. Eleven proposals have been received for FY 1999.

Requests for guidelines for exploration and exchange proposals should be sent to Karen. These guidelines are updated yearly. Scientists intending to submit proposals should begin planning several months before the proposal submission date because agreements with host countries are often much more complex than in the past. It is not possible for USDA to obtain permission for plant exploration in some countries. In some cases, it is advisable to associate additional benefit sharing with plant explorations. In 1998, benefit sharing agreements were associated with explorations for wild potatoes in Peru, wild and domesticated peppers in Paraguay and peanut landraces in Guatemala. The PEO should be consulted for advice on benefit sharing associated with plant explorations.

As part of an ongoing USDA/IPGRI/CIAT collaborative project, the use of Geographical Information Systems (GIS) for targeting cultivated plant (landrace) diversity was tested in Guatemala in November, 1997. The GIS uses cultural and physical environmental parameters correlated with known sites of cultivated plant diversity to create a model that will predict the occurrence of diversity in unexplored areas. Additional testing of the model for locating cultivated peanut diversity will be done in Guatemala and Venezuela in the coming year.

During the past year, Karen Williams participated in plant explorations for peanut landraces in Guatemala and wild and landrace *Capsicum* in Paraguay.

Ned Garvey will be participating in a plant exploration to southeastern PRC, Sept. 15 - October 18, 1998 for woody landscape plants. Hemlocks will be the primary collection target.

Assessment of Germplasm Needs

The PEO is currently utilizing several methods to identify and tabulate NPGS germplasm needs. One method extracts the identified needs from the CGC Vulnerability Reports. This information is loaded into an Excel database. Precise germplasm needs from specific countries or regions with the reason(s) it is needed is most valuable to us. Also important is the relationship of the target species to the crop species.

A second method is to define germplasm needs for wild crop relatives based on the climatic and geophysical variation within geographic ranges of all species within a crop. Dr. Robert Webster joined the PEO as a Botanist in November, 1997 to support this project. Robert has established a procedure for the analysis and interpretation of a broad range of taxonomic, ecological and geographic information to define the germplasm needs within the native distribution of taxa. Specifically, he has incorporated global GIS data on vegetation ecoregions, elevation, soils, temperature, moisture, and climatic regimes as a means of defining and isolating ecogeographically significant zones. Data from this approach are recorded in a format for the production of germplasm reports, information retrieval, and data interrogation. Incorporated within the system is a mechanism for mapping the defined need and assessment of priority of the needs with an individual crop.

Initially, Robert will be working with the small grains. He has successfully applied this approach to a treatment of barley (*Hordeum*) and has made significant progress in a soon to be completed treatment of wheat (*Triticum* and close relatives).

Cooperative Programs

Emergency Seed Collecting in Israel. Cooperator: Dr. Y. Anikster, Tel Aviv University. This is the second year of a two year project. Germplasm collected through this project is available to the NPGS sites. Plans are to expand the project to include Palestine and Jordan if appropriate funding can be obtained.

Development of the North American Plant Collections Consortium. Cooperator: American Association of Botanic Gardens and Arboreta. The consortium at this time includes 14 collections, 20 additional gardens have been solicited. The PEO has provided the Consortium with a list of 26 additional collections from 18 AABGA member institutions that would support the NPGS collections. With assistance from the DBMU, linkages have been established between GRIN and AABGA Institutions.

Regeneration of Economically Useful Plants of South India. Cooperator: Indian Agriculture Research Institute, New Delhi, India. PL 480.

In-vitro propagation/conservation of clonally propagated crops of south India. Cooperator: Indian Agriculture Research Institute, New Delhi, India. PL 480.

USDA/ARS Plant Explorations Undertaken in FY 1997

Plant Exploration	Country	Principal Contacts
Leucaena pallida	Mexico	J. Brewbaker, C. Beust
Malus spp.	People's Rep. of China	P. Forsline, H. Aldwinckle, L. Benson, L. Yunong
Grasses & legumes	People's Rep. of China	D. Johnson, T.A. Campbell, Y. Zhuomeng, A. Shazhou
Solanum spp.	Mexico	D. Spooner, H. Lazoya
Echinacea spp.	USA	K. McKeown, R. Bernatskey, M. Widrlechner
Gossypium spp.	Australia	J.McD. Stewart, J. Wendel, C. Brubaker

USDA/ARS Plant Explorations/Exchanges Planned/Undertaken in FY 1998

Plant Exploration/ Exchange	Country	Principal Contacts
Forage and Turf Grasses	Falkland Islands	S. Wright, R. Reid
Zea mays	Paraguay	W. Salhuana, S. Paniagua, G. Altamirano
Capsicum spp.	Paraguay	K. Williams, D. Williams, F. Mereles, P.J. Caballero
Sour cherry, cherry, apple	Russia	P. Forsline, A. Iezzoni, R. Karle, M. Plekhanova
Grasses and legumes	Mongolia	D. Johnson, D. Sheehy, B. Minzhigdorj
Solanum spp.	Peru	D. Spooner, Z.Huaman
Glycine max	Vietnam	R. Nelson, T. Van Lai
Vigna angularis	People's Rep. Of China	T. Lumpkin, E. Yee
Arachis hypogaea	Guatemala	K. Williams, D. Williams, C. Azurdia

Germplasm Resources Information Network (GRIN) - Jimmie Mowder

Continued maintenance of GRIN for the plant introduction stations and other NPGS management units keeping the production database operational on a 7 day per week and 24 hour per day schedule.

The graphical user interface for GRIN is under development with many technical issues being resolved on how to manipulate data with the new Oracle tools.

A new database server was installed permitting all databases to be installed on an isolated computer without competition from other functions and increases security for the databases. The time required to backup the database has been reduced to 1 ½ hours a week.

pcGRIN was totally rewritten over the past year in collaboration with IPGRI including a new user manual. A training session for the trainers was given to three people in April. A formal training session will be held in Cali, Colombia, this coming August for South American countries interested in using pcGRIN. African and Asian countries are also interested in using pcGRIN as management tools for their plant genebanks.

The DBMU are developing a database for beneficial insect data and will use experience from this effort in completing the development of the GRIN Windows access.

Continue to provide assistance to site personnel in the preparation and retrieval of data.

There is considerable interest by the animal germplasm community in getting their data into GRIN. They may provide additional funds to permit the DBMU to acquire one additional computer specialist and one animal geneticist.

We have increased the security for the NPGS computers and networks. Personnel constantly monitor the many computer advisory groups that alert users to vulnerabilities in operating systems and software packages.

The GRIN Web access displays a collection locality map. We have requested funds to upgrade the quality of the maps.

DBMU participated in a review of the FAO World Information Early Warning System (WIEWS) which is to provide a single point of contact for information on all plant genebanks of the world and summarize their holdings.

Crop Germplasm Committee Facilitation - Mark Bohning

Forty Crop Germplasm Committees (CGC) continue to provide support to the National Plant Germplasm System (NPGS) and most have been active over the last year. The NGRL continues to assist in coordinating their activities and participated in 37 of their meetings during the year. Though not all inclusive, the CGC's are supporting the NPGS by:

- identifying gaps in U.S. collections and developing proposals to fill them through exchanges or collecting trips
- assisting crop curators in identifying duplications in collections
- prioritizing traits for evaluation and developing evaluation proposals
- assisting curators and GRIN personnel in correcting and standardizing passport and evaluation data and ensuring that complete information is entered into the GRIN database
- assisting curators with regeneration projects
- identifying germplasm in breeder working collections that should be incorporated into NPGS collections and assisting with arrangements to accomplish this
- working with quarantine officials to identify and ensure implementation of new techniques for pathogen identification
- evaluating the potential benefits and problems associated with the development and use of core subsets

A seventh biennial CGC Chairs meeting will be held in Ames, IA, July 22, 1998. In conjunction with the joint Regional Technical Advisory Committee meetings. This venue provides an opportunity for the 40 chairs (or their designated representative) to interact with each other, NPGS personnel and the National Program Staff. Numerous topics relating to the NPGS and genetic resources management and use in general will be discussed. Some of these topics include: status reports from NPGS active and base collections, the role and expectations of CGCs, impact of the Convention on Biological Diversity, the status of international genetic resource programs, plant quarantine issues, the role of core subsets in managing collections, updating and correcting GRIN data, the status of plant breeding programs in the U.S. and a summary of the GAO report regarding the status of the NPGS, revising the CGC crop vulnerability reports. These reports contain information on the status and future needs of plant genetic resources regarding acquisition, preservation, evaluation and

enhancement. When possible, these reports will be made available over the Internet on the GRIN World Wide Web page (http://www.ars-grin.gov).

Appendix 3

Status of the NPGS Core Subsets (Plant Germplasm Operations Sub Committee), July 1998

USDA

United States Department of Agriculture

Research, Education, and Economics
Agricultural Research Service

July 14, 1998

SUBJECT: Status of NPGS Core Subsets
TO: PGOC Committee
FROM: Core Subset Sub-Committee

As was indicated in the 1997 Core Subset Committee report, the value of developing a core subset for each of the more than 50 species of seed propagated crops and more than 14 vegetatively propagated crops that are widely grown in the U.S. was indicated in the National Plant Germplasm System General Guidelines for Developing Core Subsets and the attached references.

As shown in the attached Status Report for 1998, a core subset has been designated for each of 23 seed propagated crops and 15 vegetatively propagated crops. For the many crops with no core subset designated, the 1997 PGOC emphasized that "... the curators need to be the driving force behind their establishment and should get assistance from the CGCs." There are 20 seed crops with more than 1,500 accessions that do not yet have a core subset designated. For each location the number of crops with over 1,500 accessions with no core subset and with a core designated are as follows: Aberdeen 4/2; Ames 6/1; College Station 1/0; Geneva 2/0; Griffin 3/6; Oxford 1/0; Pullman 3/13;Sturgeon Bay 0/1; and Urbana 1/0. The vegetative crops are as follows: Corvallis 0/12; Davis 3/0; Geneva 0/2; Riverside 1/0; Sturgeon Bay 0/1.

Only the preliminary core subsets for *Malus* and *Vitus* at Geneva and *Lotus* and *Phaseolus* at Pullman have been refined with molecular methodologies. As reported last year, most accessions designated in the core subsets are available for distribution and most of them are at least partly characterized, but more work needs to be done on most of the core subsets.

Taba and staff at CIMMYT have used the very useful multivariate clustering procedures utilizing continuous and discrete variables to improve the resulting clusters or groups developed by Crossa and staff (Franco, et al., 1997) to develop a preliminary maize core subset (20%) for the Latin American landrace collections evaluated in LAMP. Plans are being developed to evaluate additional accessions in LAMP II and to evaluate the preliminary core subset to refine it to 10% of the total collection.

As indicated in the 1997 report, if we can represent 50 to 70% of a crop's diversity (depending on the quality of the procedures for designating the core) in about 10 % of the accessions designated as the core subset, curators can put priorities for regeneration and characterization on the 10 to 15% in the core subset to be sure adequate seed is available and that users will have ready access to nearly 70% of the diversity for that crop. The cost of designating the core with geography (15 to 30%) and refining to 8 or 10% with multivariate analyses of characterization data and/or with molecular data on this 15 to 30% can be reasonable.

Core Subset Sub-Committee Members:
S. Eberhart, Chair
R. Johnson
S. Kresovich
W. Lamboy
R. Schnell
M. Widrlechner

ars

Northern Plains Area • National Seed Storage Laboratory
1111 South Mason Street • Ft. Collins, CO 80521-4500
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STATUS OF CORE SUBSETS OF NPGS CROPS 1998

Species/Crop	Active site location	Active Site no.	Core no.	Core %	No. avail. for distrib.	No. Charact-erized	Groups by Geogr.	Groups by Morph	Refined with Molecular
Aegilops	Aberdeen	2,094							
Avena / oat	Aberdeen	20,916							
Hordeum / barley	Aberdeen	27,294	2,303	8	2,118	*	X		
Oryza / rice	Aberdeen	17,279							
Secale / rye **	Aberdeen	1,905							
Triticum / wheat	Aberdeen	46,000	4,522	10	3,748	*	X		
Amaranthus	Ames	3,361							
Brassica / oilseed, vegetable **	Ames	3,163							
Cucumis / cucumber, cantaloupe	Ames	4,764							
Cucurbita / pumpkin, squash	Ames	1,003							
Daucus / carrot **	Ames	721							
Helianthus / sunflower	Ames	3,716							
Linum / flax	Ames	2,954							
Melilotus / sweetclover	Ames	908	86	9	80		Xa		
Zea / corn	Ames	15,019	249		231				
Gossypium / cotton	College Station	6,186							
Allium / onion **	Geneva	1,285							
Brassica / oilseed, vegetable **	Geneva	2,238							
Cucurbita / pumpkin, squash	Geneva	842							
Lycopersicon / tomato **	Geneva	5,791							
Abelmoschus / okra	Griffin	3,047	165	5	93	29	X	X	
Andropogon **	Griffin	36							
Arachis / peanut **	Griffin	9,553	798	8	756	190		X	
Capsicum / pepper **	Griffin	3,876							

Species/Crop	Active site location	Active Site no.	Core no.	Core %	No. avail. for distrib.	No. Charact-erized	Groups by Geogr.	Groups by Morph	Refined with Molecular
Citrullus	Griffin	1,608							
Cucurbita / pumpkin, squash	Griffin	1,240							
Cyamopsis / guar	Griffin	413							
Eleusine / finger millet	Griffin	772							
Ipomoea /sweet potato seed	Griffin	420							
Pennisetum / pearl millet	Griffin	567							
Sesamum / sesame	Griffin	1,202							
Solanum / eggplant	Griffin	929	115	12	115	78	X	X	
Sorghum / sorghum **	Griffin	30,111							
Trifolium / clover **	Griffin	1,945	95	5	81	*	a		
Vigna / cowpea, mungbean	Griffin	12,523							
Cowpea	Griffin	7,737	699	9	686	273	X	X	
Mungbean	Griffin	3,891	410	11	409	158	X	X	
Trifolium / clover **	Lexington	253							
Nicotiana / tobacco **	Oxford	2,081							
Allium / onion **	Pullman	815							
Beta / beet **	Pullman	2,141							In Progress
Bromus	Pullman	1,091							
Carthamus / safflower	Pullman	2,424							
C. Tinctorius	Pullman	2,305	210	9	210	210	X	X	
Cicer / Chickpea	Pullman	4,604							
Chickpea	Pullman	4,429	505	11	505	505	X	X	
Cucurbita / pumpkin, squash	Pullman	27							
Dactylis / orchardgrass	Pullman	1,522							
Lactuca / lettuce **	Pullman	1,315							In Progress
Lens / lentil	Pullman	2,880							
L. culinaris	Pullman	2,816	278	10	278	278	X	X	

Species/Crop	Active site location	Active Site no.	Core no.	Core %	No. avail. for distrib.	No. Charact-erized	Groups by Geogr.	Groups by Morph	Refined with Molecular
Lolium / ryegrass	Pullman	1,260							
L. perenne	Pullman	661	34	5	34	34	X	X	
Lotus / trefoil	Pullman	913							
L. comiculatus	Pullman	501	38	8	25	30	X	X	X
Medicago / alfalfa	Pullman	3,603	200	5	200	200	X	X	
Medicago / medics	Pullman	3,587	204	5	205	205	X	X	
Phaseolus / bean	Pullman	14,043							
P. vulgaris Mexico collection	Pullman	1,969	224	11	224	224	X	X	X
P. vulgaris C. & S. America	Pullman	2,820	201	7	201	158	X	X	X
Pisum / pea	Pullman	3,484	504	14	504	504	X	X	
Poa / bluegrass	Pullman	823							
P. pratensis	Pullman	396	21	5	20	21	X	X	
Trifolium / clover **	Pullman	3,871							
Red clover *T. pratense*	Pullman	1,310	85	6	85	85	X	X	
White clover *T. repens*	Pullman	842	90	11	86	86	X		
Solanum / potato seed	Sturgeon Bay	4,444	2,304	52	2176	1892			
Glycine / soybean	Urbana	20,131							

Species/Crop	Active site location	Active Site no.	Core no.	Core %	No. avail. for distrib.	No. Charact-erized	Groups by Geogr.	Groups by Morph	Refined with Molecular
	VEGETATIVE								
Corylus / filbert, hazelnut	Corvallis	611	165	27	161		X	X	
Cydonia/ quince	Corvallis	81	47	58	47		X	X	
Fragaria / strawberry	Corvallis	1,518	519	34	511		X	X	
Humulus/ Hop	Corvallis	979	82	8	61		X	X	
IGC/ intergeneric crosses	Corvallis	31	15	48	15		X	X	
Mentha / mint	Corvallis	507	49	10	49		X	X	
Pycnanthemum/ mountain mint	Corvallis	109	30	28	26		X	X	
Pyrus / pear	Corvallis	1,851	233	13	216		X	X	
Ribes / currant, gooseberry	Corvallis	1,034	322	31	298		X	X	
Rubus / raspberry, blackberry	Corvallis	1,723	527	31	486		X	X	
Vaccinium / blueberry, cranberry	Corvallis	1,205	369	31	333		X	X	
Juglans / walnut	Corvallis	14	14		11		X	X	
Juglans / walnut	Davis	444							
Prunus	Davis	1,869							
Vitis / grape	Davis	2,537							
Malus / apple	Geneva	5,072	207	4	207	207	X	X	X
Prunus	Geneva	72							
Vitis / grape	Geneva	1,504	122	8	122	122	X	X	X
Ipomoea /sweet potato	Griffin	624							
Citrus	Riverside	879							
Solanum /potato clonal	Sturgeon Bay	978	78	8	78	1			

a Groups by species

" Not yet fully characterized

** Species with limited longevity at 5 C

7/07/98

NATIONAL PLANT GERMPLASM SYSTEM
GENERAL GUIDELINES AND PROCEDURES
FOR DEVELOPING CORE SUBSETS

INTRODUCTION

Plant Introductions from centers of crop diversity have been valuable source materials for many traits, including host-plant resistance to biotic and abiotic stresses. This genetic diversity has resulted from evolutionary processes; including mutation, recombination, natural selection, genetic drift, and migration in the many ecogeographic niches. Human intervention has increased the diversity, but seed exchange during trade and migration tends to reduce diversity among ecogeographic niches.

When scientists cannot find a desired attribute in their current materials, additional germplasm must be screened. The availability of a core subset which encompasses most of the genetic diversity of the crop (and its relatives) may enhance the efficiency of identifying useful source materials and, consequently, may reduce costs.

Frankel and Brown suggest that "A core collection consists of a limited set of accessions derived from an existing germplasm collection, chosen to represent the genetic spectrum in the whole collection. The core should include as much as possible of its genetic diversity."

The core subset may be of greatest value to the scientist when there is little or no information regarding the most probable source of a desired attribute, which is often so with resistance to a new pathogen strain or a new pest biotype. When the passport and characterization databases which include information pertaining to the desired attribute are available, candidate accessions can often be listed (e.g. , accessions from areas with low soil pH when a source of aluminum tolerance is needed); but once such a list is made, accessions included in both the core subset and the list should be screened first. Only one overall core subset is needed for each crop collection, although the core may be developed in sections by working within species or other subgroups within the crop collection.

Curators of genetic resources can increase operational efficiencies by maintaining enough seeds or other propagules of accessions in the core subset to meet the expected increased demand for distributions from these samples. Although each of the total crop collections will be maintained in the NPGS base and active collections, requests for screening of accessions not in the core subset normally will not be expected until appropriate accessions in the core subset have been evaluated.

International Agricultural Research Centers (IARCs) in the CGIAR system maintain world collections of many crops. Most IARCs have developed or are in the process of developing

core subsets for crops under their mandate. Close cooperation between NPGS and the IARCs in the development of core subsets is essential.

FORMING CORE SUBSETS

General

Development of a useful core subset will vary among crops but may involve the following steps:

1. Assembling and reviewing passport data and other information to be used in establishing non-overlapping groups.
2. Assigning accessions to appropriate groups.
3. Choosing accessions for the preliminary core subset from each group.
4. Collecting data on phenotypic and genetic traits for accessions in the preliminary core subset and using multivariate analytical methods to construct clusters and dendrograms to elucidate systematic and statistical genetic relationships for further refinement of the core subset.
5. Validation and refinement.

Another step often is needed: 2a) Acquiring additional collections from under-represented or missing groups. Additional collections are frequently needed for wild and weedy crop relatives.

When resources are available to characterize and statistically analyze the entire crop collection for several descriptors, steps 2, 3 and 4 can be conducted simultaneously. Groups generated from statistical analyses of the data will usually be the most robust. If data for only a few descriptors were analyzed initially, additional descriptors may be measured for the preliminary core subset, and then step 4 repeated with data from all available descriptors. When resources are limited or large numbers of accessions must be characterized, steps 2, 3 and 4 will need to be completed sequentially. Choosing 1.5 to 3 three times the number of accessions desired for the final core in step 3 is desirable (e.g., choose 15 to 30% in step 3 for characterization and evaluation in step 4 if 10% will be chosen for the final core).

Grouping and Sampling

Brown recommended stratified sampling methods when establishing core subsets. Grouping begins with taxonomic affinity (e.g., species, subspecies, cytological races). Accessions within each taxon can then be assigned to strata based on ecogeographic zones and genetic characteristics (e.g., ploidy level, photoperiod response, races, etc.). Often the distribution patterns for genetic characteristics largely coincide with ecogeographic zones. Groups such as races of maize (based primarily on ear morphology) may be preferable to countries of origin for defining groups because geopolitical boundaries often are incongruent with ecogeographic niches. In other crops, country of origin (or region of adjacent countries) may be the only reasonable means for developing preliminary groups.

Improving the accuracy of passport information (e.g., country of origin, taxonomic identification, race, etc.) is very important for assigning accessions to appropriate groups. When some accessions lack data regarding criteria used for grouping (origin, race, etc.), a group containing these "unknown" accessions can be formed so that the core still includes a representative sample. In step 4, the statistical analysis should assign unknown samples to appropriate clusters. Inclusion of a group of elite cultivars, or parental lines, and elite breeding populations may be desirable for most crops.

Brown recommended that the core subset comprise about 10% of the crop collection, but this may vary from 5% for very large collections to 50% or more on very small collections, with about 3000 suggested as a maximum number.

Proportional sampling (log proportional, square root, etc.) within each group may provide a more representative sample of the total genetic diversity in the core subset than would a completely random sampling from the crop collection. Multiplication by an appropriate factor to obtain the total number of core accessions equal to the desired percentage of the crop collection may be necessary. Heavier weighing of strata for primary and secondary centers of genetic diversity may have merit.

Once the number needed from each group has been determined, accessions for the core subset are usually chosen randomly within each group. However, some curators are choosing accessions with more desirable agronomic traits within each group. Pedigree information can be used to ensure that maximum genetic diversity is included within the group of improved cultivars or parental lines.

As soon as the preliminary core subset has been developed, this information should be recorded in GRIN and utilized.

REFINING THE CORE SUBSET

With the reduced number of accessions in the preliminary core subset, characterizations and evaluations can be conducted to obtain data needed for statistical analyses to measure genetic divergence and diversity within the core. Phenotypic and genotypic data have been used. Heritability, degree of polymorphism, and distribution of genetic factors among chromosomes affect reliability of groupings. A minimum of 10 descriptors is suggested, and more than 15 would be better.

Assigning heavier weights to genetic descriptors and highly heritable phenotypic traits may improve clustering. After clustering, confirmation by ordination in 2 or 3 dimensions from a principal component analysis has merit. Use of molecular characterizations, such as microsatellite, RAPD, and RFLP markers, is encouraged whenever feasible.

Clusters generated by multivariate analyses may provide a better understanding of patterns of genetic divergence and diversity and will often identify ecogeographic regions that have not been adequately sampled, especially when the origin of each accession is plotted geographically. This information may be valuable in planning future acquisitions.

When statistical analyses reveal close similarities among certain core accessions, one accession may be retained in the core and other very similar accessions may be replaced by new samples (usually from the same group, but sometimes from an under-represented group). For the larger clusters, statistical analyses can often assist with reducing the number of accessions in the core without decreasing the genetic diversity included in the core subset.

The core subset should remain dynamic, with accession additions, deletions, and substitutions as additional pertinent information becomes available and as new accessions are acquired. Nevertheless, with time, changes to the core should decrease in frequency and magnitude.

PLANT GERMPLASM OPERATING COMMITTEE

Core Subset Sub-Committee

S. Eberhart, Chair[1]
R. Johnson
S. Kresovich
W. Lamboy
R. Schnell
C. Sperling
M. Widrlechner

August 22, 1994

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REFERENCES

Basigalup, D.H., D.K. Barnes, and R.E. Stucker. 1995. Development of a core collection for perennial *Medicago* plant introductions. Crop Sci. 35:1163-1168.

Beer, S.C., J. Goffreda, T.D. Phillips, J.P. Murphy, and M.E. Sorrells. 1993. Assessment of genetic variation in *Avena sterilis* using morphological traits, isozymes, and RFLPs. Crop Sci. 33:1386-1393.

Brown, A.H.D. 1989. The case for core collections. *In* Brown, A.H.D., Frankel, O.H., Marshall, D.R. and Williams, J.T. (eds.), The Use of Plant Genetic Resources, pp. 136-156. Cambridge Univ. Press, Cambridge.

Brown, A.H.D. 1989. Core collections: A practical approach to genetic resources management. Genome 31:818-824.

Brown, A.H.D. 1992. Genetic variation and resources in cultivated barley and wild *Hordeum*. Barley Genetics 6:669-682.

Brown, A.H.D. 1995. The core collection at the crossroads. *In* T. Hodgkin, et al. (eds.) Core collections of plant genetic resources. John Wiley and Sons, Chichester, U.K.

Brown, A.H.D., J.P. Grace, and S.S. Speer. 1987. Designation of a "core" collection of perennial *Glycine*. Soybean Genetics Newsletter 14:59-70.

Chang, T.T. 1989. The case for large collections. *In* Brown, A.H.D., Frankel, O.H., Marshall, D. R. and Williams, J.T. (eds.), The Use of Plant Genetic Resources, pp. 123-135. Cambridge Univ. Press, Cambridge.

Crossa, J., S. Taba, S. A. Eberhart, P. Bretting, and R. Vencousky. 1994. Practical considerations for maintaining germplasm in maize. Theor. Appl. Genet. 89:89-95.

Dahlberg, J.A., X. Zhang, G. E. Hart, and J. E. Mullet. (Submitted) Comparison of Clustering Methods of RAPD Marker Analysis and Statistical Clusters Based on Seed Imaging Techniques for use in Development of the Sorghum Core Collection. Crop Sci. (In review)

Diwan, N., G. R. Bauchan, and M.S. McIntosh. 1994. A core collection for the United States annual *Medicago* germplasm collection. Crop Sci. 34:279-285.

Erskine, W., and Muehlbauer, F.J. 1991. Allozyme and morphological variability, outcrossing rate and core collection formation in lentil germplasm. Theor. Appl. Genet. 83:119-125.

Frankel, O.H. 1984. Genetic perspectives of germplasm conservation. *In* Arber, W., Llimensee, K., Peacock, W.J. and Starlinger, P. (eds.), Genetic Manipulation: Impact on Man and Society, pp. 161-170. Cambridge Univ. Press., Cambridge.

Frankel, O.H., and A.H.D. Brown. 1984. Current plant genetic resources - a critical appraisal. *In* Genetics: New Frontiers, Vol. IV, pp. 1-11. Oxford & IBH Publ. Co., New Dehli.

Frankel, O.H., and M.E. Soulé. 1981. Conservation and Evolution. Cambridge Univ. Press, Cambridge.

Franco, J., J. Crossa, J. Diaz, S. Taba, J. Villasenor, and S.A. Eberhart. 1997. A Sequential Clustering Strategy for Classifying Gene Bank Accessions. Crop Science 37:1656-1662.

Franco, J., J. Crossa, J. Villasenor, S. Taba and S.A. Eberhart. 1997. Classifying Mexican maize accessions using hierarchical and density search methods. Crop Science 37: 972-980.

Franco, J., J. Crossa, J. Villasenor, S. Taba and S.A. Eberhart. 1998. Classifying genetic resources using categorical and continuous variables. Crop Sci. 38: (In press).

Franco, J., J. Crossa, J. Villasenor, A. Castillo, S. Taba and S.A. Eberhart. 1999. Resources in multiple environments. Crop Sci. (In press).

Harlan, J.R. 1972. Genetic resources in sorghum. *In* Rao, NGP, and L.R. House (eds.) Sorghum in the seventies, pp. 1-13. Oxford and IBH Publ. Co., New Delhi.

Hodgkin, T., A.H.D. Brown, Th.J.L. van Hintum and E.A.V. Morales (eds.). 1995. Core collections of plant genetic resources. John Wiley and Sons, Chichester, U.K.

Holbrook, C.C., W.F. Anderson, and R.N. Pittman. 1993. Selection of a core collection from the U.S. germplasm collection of peanut. Crop Sci. 33:859-861.

Knüpffer, H., and Th.J.L. van Hintum, 1995. The Barley Core Collection - an international effort. *In* T. Hodgkin, et al. (eds.) Core collections of plant genetic resources. John Wiley and Sons, Chichester, U.K.

Kouame, C.N., and K.H. Quesenberry. 1993. Cluster analysis of a world collection of red clover germplasm. Genet. Res. and Crop Evol. 40:39-47.

Marshall, D.R. and A.H.D. Brown. 1975. Optimum sampling strategies in genetic conservation. *In* Frankel, O.H. and J.G. Hawkes (eds.), Genetic Resources for Today and Tomorrow, pp. 53-80. Cambridge Univ. Press, Cambridge.

National Research Council 1991. Managing global genetic resources: the U.S. National Plant Germplasm System. National Academy Press, Washington, D.C.

National Research Council. 1993. Managing global genetic resources: agricultural crop issues and policies. National Academy Press, Washington, D.C.

Nei, M., and W.H. Li. 1979. Mathematical models for studying genetic variation in terms of restriction endonucleases. PNAS USA 76:5269-5273.

Peeters, J.P., and J.A. Martinelli. 1989. Hierarchical cluster analysis as a tool to manage variation in germplasm collections. Theor. Appl. Genet. 78:42-48.

Perry, M.C., M.S. McIntosh, and A.K. Stoner. 1991. Geographical patterns of variation in the USDA soybean germplasm collection. II. Allozyme frequencies. Crop Sci. 31:1356-1360.

Schoen, D.J., and A.H.D. Brown. 1995. Maximizing genetic diversity in core collections of wild crop relatives. *In* T. Hodgkin, et al. (eds.) Core collections of plant genetic resources. John Wiley and Sons, Chichester, U.K.

Smith, O.S., and J.S.C. Smith. 1992. Measurement of genetic diversity among maize hybrids; a comparison of isozymic, RFLP, pedigree, and heterosis data. Maydica 37:53-60.

Sneath, P.H.A., and R.R. Sokal. 1973. Numeric taxonomy. W.F. Freeman and Company, San Francisco, CA.

Spagnoletti Zeuli, P.L., and C.O. Qualset. 1993. Evaluation of five strategies for obtaining a core subset from a large genetic resource collection of durum wheat. Theor. Appl. Genet. 87:295-304.

Spagnoletti Zeuli, P.L., and C.O. Qualset. 1987. Geographical diversity for quantitative spike characters in a world collection of durum wheat. Crop Sci. 27:235-241.

Taba, S., J. Diaz, F. Pineda E., J. Franco, and J. Crossa. 1998. Pattern of Phenotypic Diversity of the Caribbean Maize Accessions. Crop Sci. 38: (In press).

Tohme, J., D. O. Gonzales, S. Beebe, and M. C. Duque. 1996. AFLP analysis of gene pools of a wild bean core collection. Crop Sci. 36:1375-1384.

Tohme, J., P. Jones, S. Beebe, and M. Iwanaga. 1994. The combined use of agroecological and characterization data to establish the CIAT *Phaseolus vulgaris* core collection. *In* T. Hodgkin, et al. (eds.) Core collections of plant genetic resources. John Wiley & Sons, Chichester, U.K.

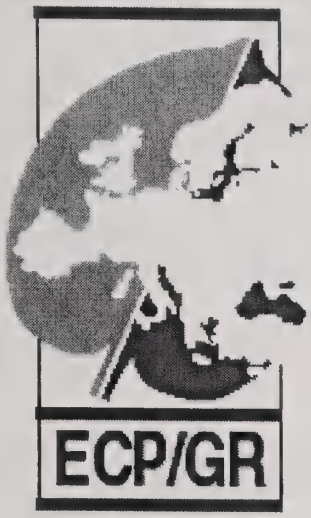
Vaughan, D.A. 1991. Choosing rice germplasm for evaluation. Euphytica 54:147-154.

Williams, W.T. 1971. Principles of clustering, Ann. Rev. Ecol. Syste. 2:303-326.

7/15/98

Appendix 4

WBN Meeting - 3rd and final call for presentations



Third Announcement

5th International *Beta* Genetic Resources Workshop

and

World *Beta* Network Meeting

7 – 10 September, 1999

at

The Institute of Arable crops Research – Broom's Barn
Bury St Edmunds, Suffolk, UK

12.05 - 12.30 **K. Schneider, D. Borchardt, R. Schaefer-Pregl, C. Glass & F. Salamini**
Towards a map of functional genes focused on carbohydrate metabolism

12.30 - 12.55 **A. Svirshchevskaya & J. Dolezel**
Beet Gynogenetic lines: Induction, Flow Cytometry and Technological Estimation

Lunch

Germplasm : Conservation and Evaluation

14.00 – 14.25 **L.Frese**
The Synthetic *Beta* Core Collection – State of the Art

14.25 – 14.50 **M.C. Luterbacher, J.M. Smith, M.J.C. Asher & L. Frese**
Disease Resistance In Collections of *Beta* Species

14.50 – 15.15 **J. Zakova**
Review of genetic resources of sugar beet in Slovakia

Exploitation of Germplasm

15.15 – 15.40 **S.A. Francis, D.M. Chwarszczynska & M.J.C. Asher**
Exploiting novel sources of disease resistance in *Beta* germplasm using molecular markers

15.40 – 16.05 **J. Mitchell McGrath**
Beta Breeding and Genetics at East Lansing: Molecular Methods, Genetic Diversity and Trait Elucidation

Tea/Coffee Break

16.30 – 16.55 **L. Panella**
Twenty Years of Screening Sugar Beets for Resistance to *Rhizoctonia solani*

16.55 – 17.20 **S.Y. Sadeghia-Motahar**
Genetic variation for drought stress in sugar beet

18.00 – 19.00 Poster Session (provisional programme)

J. Abe, H. Jinno, G.P. Guan & Y. Shimamoto
Genetic diversity and pollination system of oriental leaf beets

M. J. Bassati Karvaneh
Powdery mildew resistance in sugar beet varieties

V.I. Burenin
Adaptogenesis in *Beta* L.

L. Dalke, K.Kudowicz, W. Podyma, D. Nowosielska, P. Hauptvogel & R.L. Boguslavskij
Variation in beet resources collected in Ukraine & Slovak Carpathian mountains expeditions.

S. Driessen, M. Pohl-Orf & D. Bartsch
Origin & diversity of Baltic sea beet populations in Germany

C. Germeiner
The European Beta Project : Synopsis of Results

I. Liović, A. Kristek & M. Rastija
Genetic diversity for some agronomical traits in sugarbeet

E. Ober, M.C. Luterbacher, C.J.A. Clark, J.M. Smith, K.W. Jaggard, M.J.C. Asher, J.D. Pidgeon & L. Frese
Drought tolerance in *Beta* germplasm: results from field and growth chamber screens

Z. Sadoch, R. Wierzchosławski & T. Pańczyk
Mitochondrial DNA variation in maintainer lines (O-type) of sugar beet

Z. Sadoch, R. Wierzchosławski & T. Pańczyk
Molecular analysis of genetic diversity in sugar beet breeding materials

Y.N. Shavrukov
Localization of second monogerm gene in sugar beet using RFLP markers.

H.M. Srivastava, H.N. Shahi & M.P. Agrawal
Genotype x Environment interactions in sugar crops

S. Srivastava & H.M. Srivastava
Cytological and Karyotypic Studies in some species of genus *Beta*

Z. Stenho, Chytilová & Faberová
Beta Genetic Resources in the Czech Republic

R. Tamosiuniene
Fodder and sugar beet breeding, germplasm collection and usage in Lithuania

ECP/GR Beta Working Group meeting held jointly with WBN members (L. Frese to revise)

Thursday 9 September, 1999

09.00 Opening and Introduction

Information on phase VI of the ECP/GR programme (L.Maggioni)

Report of the WBN secretary (L.Frese)

Election of the WG chairman

Information exchange
- IPGRI/FAO Multicrop passport list (L.Maggioni)
- International Data Base for Beta - state of the art (L.Frese)
- Characterisation and evaluation data

EU project GENRES CT95 42 (D.Ziegler)
- Identification of duplicates
- Technical organisation of the SBCC

ECP/GR national status reports (5 minutes per country)

Sharing responsibilities for conservation in Europe

Co-operation between European countries and the WBN

Genebank quality standards

- Reports of attending genebanks

Opportunities for in-situ-conservation of wild beet species

- in the Atlantic distribution area (M.Lefort)
- in the Mediterranean distribution area (N.Stavropoulos)
- in inland areas of Greece, Turkey and the Transcaucasian area (A.Tan)

New approaches to genepool management (M.Lefort/B.Desprez)

Collecting activities

Recommendations and commitments

Drafting of the report

Discussion and approval of the report

19.30 Conference Dinner

Friday 10 September

a.m. *Beta* germplasm research at IACR-Broom's Barn
Laboratory and field tour

p.m. Local excursion, including *B.v.* spp. *maritima* populations

Saturday 11 September

All day excursion, including the Royal Botanic Gardens, Kew

Instructions to contributors

Oral contributions are strictly limited to 25 minutes, including discussion time. Facilities for slide (35 mm transparencies) and overhead projection will be provided. An SVGA-compatible projector will be available for Powerpoint 97 presentations.

Poster presentations will be on boards 110 cm wide x 80 cm high. Contributors will be provided with 2 such boards, one mounted above the other (i.e. overall dimensions 110 cm wide x 160 cm high).

Instructions to authors

Oral and poster contributions may be submitted for publication in the Journal of Sugar Beet Research. Papers should be a maximum of 4 pages and prepared according to the enclosed 'Instructions to Authors'. Papers should be handed in during the Workshop and will be subject to the journal's normal review process. Scripts received after 10 September cannot be considered for inclusion.

Accommodation

Accommodation has been arranged at:

The Butterfly Hotel
Symonds Road
Bury St Edmunds
Suffolk IP32 7BW
UK

Tel: +44 1284 760 884
Fax: +44 1284 755 476

The cost is £63 single, £70 double (including breakfast and taxes).

Please book your own accommodation, quoting **WBN** when making your booking.

The hotel is situated on the edge of the town. Transport to and from IACR-Broom's Barn will be provided.

How to reach Bury St Edmunds

An hourly collection service from Stansted airport will be provided on Tuesday 7 September. A WBN Assembly Point will be located near the Arrivals gate. Delegates arriving at other London airports (Heathrow or Gatwick) can reach Stansted on the Airlinks (2 hourly) inter-airport coach service. Stansted can also be reached by a regular train service from London's Liverpool Street station.

Alternatively, delegates may travel to Cambridge. From there, trains to Bury St Edmunds run at :

Depart Cambridge	Arrive Bury St Edmunds
10.09	10.50
12.45	13.26
14.16	14.57
17.05	17.46
18.05	18.46
21.33	22.15

It would be helpful if delegates could let the organizers (E-mail: **melanie.allison@bbsrc.ac.uk**) know their travel arrangements and expected flight arrival time in the UK.

Further information can be obtained from:

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Appendix 5

Minutes of the 3rd GENRES CT95 42 Meeting

Minutes of the 3nd co-ordination meeting GENRES CT9542

Place:	Hotel Capsis, Thessaloniki, Greece
Date:	30 September, 1998
Present:	L.Frese (P1), N.Stravopoulos (P4), R.Jansen (P5), G.Koch (P6), W.Lange (P7), M.Asher (P8), E.Biancardi (P9), E.DeAmbrogio (P10), B.Bentzer (P11)
Guests:	Z.Stehno (Czech Gene bank), M. and B. Desprez (company Desprez), L.Panella (USDA/ARS, ~~Fargo~~), Sun Yichu (Institute of Sugarbeet Research, Hulan), G.Steinrücken (Novartis)
Excused:	B.V.Ford-Lloyd (P2), V.I.Burenin (VIR), K.Hammer (IPK, P3), D.Grzebelus (University of Cracow),
Minutes:	L.Frese

1. Opening
The meeting was opened by L.Frese at 18.00 hr, who welcomed the participants and guests. He thanked the project partners for their constructive collaboration during the past project year.

2. Acceptance of agenda
The agenda was accepted.

3. Co-ordinators report

Financial report

Council regulation 1467/94
The co-ordinator informed the participants on the 3rd call for proposal. Since it was known that the CEC intended to fund animal genetic resources projects and plant genetic resources projects of crops that have not been considered to-date, the chance to get money for an extension of the Beta project seemed to be very low. The BAZ Gene Bank is responsible for a wide range of crops and contributed therefore to project proposals of Avena, wheat, barley, Brassica and Daucus.

ECP/GR Beta working group
The advantages of the recently established Beta genetic resources working group (Beta WG) of the European Co-operative Programme for Crop Genetic Resources Networks (ECP/GR) were explained by L.Frese. The new working group will allow a more intense co-operation between European gene banks holding Beta accessions. The Beta WG will supplement the work of GENRES CT95 42.

Technical report
It was noted that the breeding companies had accomplished most of the seed increase work according to the work plan. The gene banks have to continue with this task until the year 5. In 1998 many seed samples classified as 'endangered samples' have been multiplied. It was noted that gene banks have to concentrate the seed

multiplication work on 'core collection' samples which are urgently need by the partners.

The co-ordinator then described the increasing gaps between the yearly milestones and the actual amount of evaluation data returned to the co-ordinator. He also mentioned that some of the data sets do not correspond to the data exchange format agreed upon during earlier meetings and that some partners will be requested to modify the sets. Nevertheless 8 accessions having low scores for one disease also scored low to medium for a second disease. These accessions could be particularly interesting for germplasm enhancement programmes. The co-ordinator emphasised that the project is already yielding valuable results.

ECP/GR Beta projects
With the financial support of the ECP/GR, a collaboration with East European partners has been started. The gene banks in Prague, the University of Cracow and the Vavilov Institute in Russia are implementing projects to promote the use of East European *Beta vulgaris* germplasm collections. This collaborative project is additional to the GENRES-programme and also implicates seed increase and evaluation of germplasm (morphological characterisation, screening for disease resistance (*Fusarium, Phoma*) and molecular characterisation). Reports on the various activities are presented in the appendix.

4. Report of project partners

4.1 Seed increase

P1. BAZ, FALP
Most of the work has been carried out. Another set of material from the USDA/ARS arrived at Braunschweig and will be fed into the seed multiplication programme. As recommended during the 2nd co-ordination meeting the co-ordinator has provided the USDA/ARS with 63 large seed samples from the project's rest seed stock. This material can be used by the US partners for evaluation.
670 of the maximal 700 core collection samples are available at Braunschweig. Project partners charged with the evaluation work will receive seed samples in January 1999, 2000 and 2001. If the plan is not changed, project partners KWS, SPSB/ISCI and BROOMS will receive about 25 samples of hard seeded accessions each year.

The co-ordinator remembered partners responsible for seed multiplication to send the core collection samples to Braunschweig no later than early November, 1998. The BAZ Gene Bank has to inventory the samples, polish them, conduct germination tests and dispatch the samples to evaluators.

No real progress was achieved with respect to breaking seed hardedness and seed dormancy in wild accessions. To study this problem in more detail, a student working at the BAZ gene bank did literature research and tested seed treatments to overcome the dormancy problem of Beta section Beta accession. The 'seed priming' method recommended by Broom's Barn showed positive effects in some cases. The 1998 experiences showed that more investigations would be necessary to better understand the underlying causes for seed dormancy. A project proposal has been written by the co-ordinator and submitted to a German funding agency by the department 'Seed Physiology' of the Institute Crop Science (FAL) at Braunschweig. All participants agreed that it is important to study the seed dormancy phenomenon and the problem of the seed hardedness (e.g. in sections *Corollinae* and *Procumbentes*) further.

L.Frese noted that the results, if project funds become available, will not benefit the GENRES CT95 42 project in time. Every glomerule of hard seeded accessions must be prepared by removing the pericarp cap by hand. If we want to evaluate 76 hard seeded accessions of the core collection the calculated labour time is beyond the project's capacity. The co-ordinator mentioned that the Chinese counterpart would be willing to employ additional staff required to prepare seeds for evaluation work on the basis of 280 DM contracts per months and person. The project partners recommended that the co-ordinator should try to organise outsourcing of this work.

The option to refrain from testing hardseeded material in the project was also discussed. This option was rejected by breeders arguing that sections II (Corollinae) and IV (Procumbentes) might possess resistance genes not contained in the section I (Beta). It was recommended to reduce the number of replications in the case of sections II and IV which would reduce labour for seed preparation. Partners were ask to inform the co-ordinator pertaining to the total number of plants they would need for testing accessions of hardseeded species. Because accessions of Corollinae (half-sib families, apomictic breeding system) and Procumbentes species often show less within accession variability than Beta section Beta germplasm, the total number of plants per test could perhaps be reduced. It was mentioned that not all of the characters need to be screened in the case of Corollinae accessions. L. Frese noted that all B.macrorhiza accessions which were grown in the past for seed multiplication had been infested by powdery mildew. Hence, it would make little sense to look for Erysiphe resistance in such materials. Because salt and drought resistance are more complex inherited characters it would be difficult to introgress salt or drought resistance from sections II and IV into the sugar beet. It was felt that these characters need not to be evaluated. Testing of hardseeded species should be done in the case of BNYVV, Cercospora beticola, BMYV and BYV, Aphanomyces, Pythium and Rhizoctonia, only.

The partner gene banks were then requested to comment on the seed multiplication work. The Greek Gene Bank noted some problems with very early bolting seed plants which produced only very little seed yield. N.Stavropoulos explained that accessions with insufficient seed yield in the first year will again be grown to produce the amount of seeds required by the project. Z.Stehno from the Czech gene bank reported on the progress of his seed multiplication programme and said that seed samples would be made available for the evaluation work in due time.

4.2 Evaluation activities

In response to the co-ordinator's reminder to fulfil the milestones agreed upon the partners explained the reasons of lagging behind working schedule. In several cases testing procedures established for sugar beet proved to be too inaccurate for wild beets. Testing procedures had to be refined during the 1st and 2nd project year and this has delayed routine screening. In other cases handling of annual types in field test met serious problems.

The co-ordinator remembered that the project milestones have been defined very clearly. If less evaluation data are generated by project partners than envisaged the CEC might require accomplishment of the work plan. Some partners disagreed and said that the CEC would not estimate the value and success of a project on the basis of complete fulfilment of the work plan but would rather assess the total impact of the project on agriculture in the EU. Because resistant materials have already been detected and the positive impact of the project is already there.

P5. KWS: Screening for resistance to *Rhizoctonia solani*

R. Jansen described the work done so far and explained how KWS will organise the evaluation work to achieve the project milestones.

P8. Broom's Barn: Screening for resistance to various diseases and stress tolerance
M.Asher reported on the evaluation results of 1998. He explained that most of Broom's Barn's project targets will be fulfilled if the co-ordinator can provide enough seed samples in time. He noted that he had hoped to test drought and salt tolerance with the same procedure which proved not to be impossible. The co-ordinator was asked to inform the CEC on this problem and notify the CEC on the change of the work plan.

P9. ISCI: Screening for resistance to BNYVV
E. Biancardi informed the group that his work programme is on schedule.

P7. CPRO-DLO
W.Lange presented results on BNYVV screening of accessions (i) identified by partner 9 as 'promising' material and (ii) hard seeded accessions under controlled conditions. Several accessions contained plants with a low virus content. The results between the field test in Italy and the laboratory test in Wageningen deviated for still unknown reasons.

P10. SPSB: Screening for resistance to *Cercospora beticola*
E.DeAmbrogio explained that he would like to discontinue with testing gene bank accessions at the breeding station. Early bolting plants are not only hard to test in the field but are also a legal problem in this particular area. The co-ordinator mentioned that the BAZ Gene Bank has evaluated a leaf disk assay developed at the University of Kiel. The evaluation of the method was mainly done by Assist.Prof. Ma Yahuai from the Institute of Sugarbeet Research (CAAS) during his stay at Braunschweig. It seems that this method cannot be used for testing annual beets. There was a consensus amongst partners that reliable results cannot be produced in the case of annual beets with this method.

The project group suggested that the screening should be conducted at another location and E.Biancardi promised to assist in finding a solution for this logistic problem.

5. Publication and dissemination of information
The co-ordinator inquired participants whether the group should write a joint publication on the first project results. He noted that this publication should not be seen as a scientific publication in the strict sense. It should rather inform the public on the general output of the work done so far. The suggestion was not supported by the participantsIt was noted that a description of the project progress on the BAZ Gene Bank homepage would suffice.

6. Close of the meeting
It was noted with satisfaction that promising materials have been detected. Requests for germplasm identified by project partners as potential donors for resistance breeding received from institutions not involved in the project show that the project starts to benefit the whole user community. The co-ordinator stressed that any user of the BAZ Gene Bank has free access to the original accession stored in the gene bank. Since no legal project agreement exists on the mutual exchange of breeding lines (selected single plants and progenies of these) derived from interesting accessions, such material needs to be exchanged on the basis of specific

agreements. The co-ordinator thanked all participants for their reports and contributions to the discussions.

The meeting was closed at 21.00 h.

Braunschweig, 27 October 1998
Dr. L. Frese

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